APPENDIX C

HUMAN HEALTH RISK ASSESSMENT WITH CONCEPTUAL SITE EXPOSURE MODEL

HUMAN HEALTH SCREENING ASSESSMENT
REMOVAL ACTION WORKPLAN

PENRYN PROPERTY
Penryn, California

Prepared for:
Penryn Development, LLC
3990 Ruffin Road, Suite 100
San Diego, California 92123

Prepared by:
Wallace-Kuhl & Associates, Inc.
500 Menlo Dr., Suite 100
Rocklin, California 95765

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1.0 INTRODUCTION

1.1 Purpose

The purpose of the human health screening assessment is to provide risk management data about the potential risks to human health and the environment associated with chemicals detected in soils at the site. This assessment will inform decisions made regarding whether further characterization, risk assessment, or remedial actions are necessary.

The methodology for identifying and assessing hazard and risk at the property follows the procedures outlined in the DTSC's 1994 (second printing June 1999) Preliminary Endangerment Assessment Guidance Manual. In addition, DTSC's Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities (DTSC, 1992), and Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments at Hazardous Waste Sites (HERD, DTSC, February 1997) were consulted.

1.2 Components

The human health screening encompasses descriptions of four basic components to help to assess the potential risk present at the site: 1) exposure pathways and media of concern, 2) chemicals and exposure concentrations, 3) toxicity values, and 4) risk characterization summary. The four components are described in more detail in the following sub-sections.

1.2.1 Exposure Pathways and Media of Concern

This component of the human health screening provides a detailed description of the media at the site, which are considered impacted, potentially impacted, or which could potentially become impacted. This component also includes a description of the pathways and routes by which populations might be exposed at the site and describes the populations that are considered to be potentially exposed at the site.

1.2.2 Exposure Concentrations and Chemicals

This component of the human health screening describes the chemicals detected during site characterization, the concentrations and spatial distribution of the chemicals on the site, evaluates detected analytes as COPCs, and presents calculations or arguments for determining concentrations used as the input – or "exposure point" - concentrations (EPCs) in further COPC.

1.2.3 Toxicity Values

The Toxicity Values component describes the relevant human toxicity information available for each identified COPC, and supplies references for the source of each toxicity criterion used.

1.2.4 Risk Characterization Summary

The Risk Characterization summarizes the results of the screening exposure assessment and integrates them with the available toxicity information, presenting the significant findings, such as the risks and hazards estimated for the chemicals at the property and the conclusions regarding the human health screening.

2.0 EXPOSURE PATHWAYS AND MEDIA OF CONCERN

This section presents potential exposure pathways and receptors on the subject property using a Conceptual Site Model (CSM). A conceptual site model is a three-dimensional "picture" of site conditions that illustrate contaminant contributions, release mechanisms, exposure pathways and migration routes, and potentially exposed populations (USEPA, 1996). It describes the suspected sources of chemicals, fate and transport mechanisms that distribute the chemicals within the environment, the potentially exposed human populations, and the potentially complete exposure pathways. The conceptual site model presents a hypothesis but does not demonstrate actual exposure and/or effects on receptors. Plate C-1 presents a CSM for the potential primary exposure pathways to the human receptors at the site. Surface water tests did not yield any COPCs (see Table C-1). Moreover, surface water will not be used as a drinking or recreational water supply source. This model therefore does not incorporate water as a theoretical pathway of a site contaminant. It is reasonable, for purposes of this investigation and cleanup, for soil to be considered the only significant potential medium of concern and exposure pathway.

The default exposure pathways of potential concern for soil exposures are therefore:

- Inhalation of airborne dust
- Incidental ingestion of soil
- Dermal contact with soil.

3.0 IDENTIFICATION OF COPCs AND EXPOSURE CONCENTRATIONS

3.1 Chemicals Detected at the Property

3.1.1 Organic COPCs Detected at the Property

On the basis of the previous site sampling and analysis, organochlorine pesticide compounds DDE, DDT, endrin and methoxychlor were identified in site soils. These organic pesticides are anthropogenic and are therefore immediately categorized as COPCs. Inorganic chemical analytes detected in site samples consisted of arsenic, barium, cobalt, chromium, copper, lead, nickel, vanadium and zinc. These analyte concentrations were screened against corresponding background metals concentrations for identification of inorganic COPCs. Report Tables C-2 and C-3 present Site Data Summaries from the SSI I and the SSI II, respectively, and contain statistical elements used in the selection of inorganic COPCs.

Note: DDD was detected at 100 µg/kg in only one of 30 samples analyzed for OCPs. This value however was obtained from a composite sample. Subsequent analysis of the three individual samples comprising the composite did not yield a detection of DDD above method reporting limits in any sample. For this reason WKA chose not to include DDD as a COPC.

3.1.2 Selection of Inorganic COPCs

In previous investigations (WKA, 2006a and WKA, 2006b), CAM-17 analytes detected in shallow site soils were evaluated against background samples collected from six deep samples deemed representative of background soil conditions. This indicated that, with the exception of arsenic and lead, all detected site metals were sufficiently below the mean or maximum background concentrations to eliminate them from further consideration as COPCs. Moreover, with the exception of arsenic and lead, none of the metals detected were detected at concentrations at or above levels established as harmful to human health and the environment based on CHHSLs (DTSC, 2005).

3.2 Exposure Point Concentrations

EPCs are the representative chemical concentrations that receptors (residents) may contact through each defined exposure scenario and each exposure route (inhalation, ingestion, dermal contact) on the subject property. For purposes of this HHRA, both the maximum detected COPC concentrations, and then the 95% UCLs of the arithmetic means of the COPC concentrations are evaluated as EPCs. Given the proposed use for

this site as multifamily residential units, use of the 95% UCLs, which averages concentrations, is a reasonable approach on which to base risk management recessions. Lead is evaluated separately via the Leadspread Assessment Spreadsheet (DTSC, 1999b). Again, both the maximum and the 95% upper confidence limit (UCL) values are used to evaluate site lead.

4.0 TOXICITY ASSESSMENT

Toxicity values for many chemicals are published in the U.S. EPA on-line Integrated Risk Information System (IRIS; U.S. EPA, 2000). Additionally, the California Office of Environmental Health Hazard Assessment (OEHHA, 1994) publishes toxicity values for carcinogens. Cancer slope factors (CSFs) are chemical-specific, experimentally derived, potency values used to calculate the risk of cancer resulting from exposure to carcinogenic chemicals. A higher value implies a more potent carcinogen. Reference doses (RfDs) are experimentally derived "no-effect" values used to quantify the extent of non-carcinogenic toxic effects from exposure to chemicals. Here, a lower value implies a more potent toxicant. These criteria are generally developed by U.S. EPA risk assessment work groups and listed in U.S. EPA risk assessment guidance documents and databases. The CSFs and RfDs (Toxicity Criteria of COPCs) available for the site COPCs are presented in Table C-4.

4.1 Non Carcinogenic Toxicity

Arsenic, DDE, DDT, endrin, and methoxychlor, identified on the subject property as COPCs, have established RfDs used to evaluate non-carcinogenic adverse health effects. Arsenic has an RfD of 3×10^{-4} mg/kg-day for oral exposure, with no established inhalation exposure toxicity, the same 3×10^{-4} mg/kg-day value is therefore used as the default inhalation exposure toxicity. DDE and DDT both have an RfD of 5×10^{-4} mg/kg-day for oral and inhalation exposures. Endrin has an RfD of 3×10^{-4} mg/kg for both oral and inhalation exposures. Methoxychlor has an RfD of 5×10^{-3} mg/kg for both oral and inhalation exposures.

4.2 Carcinogenic Toxicity

Arsenic, DDE and DDT have established oral CSFs of 9.5, 0.34 and 0.34 $(mg/kg\text{-}day)^{-1}$ respectively, and inhalation CSFs of 12, 0.34 and 0.34 $(mg/kg\text{-}day)^{-1}$ respectively (OEHHA, 1994).

Both non-carcinogenic toxic effects (Hazard index) and theoretical upper-bound incremental lifetime cancer risks are evaluated for the identified COPCs in the following section of this report.

5.0 RISK CHARACTERIZATION

In this step of the HHRA, the estimated rate at which a person incidentally takes in a chemical is compared with information about the toxicity of that chemical to estimate the potential risks to human health posed by exposure to the chemical. This section presents the risk characterization methods used in this assessment.

5.1 Quantification of Exposure

The PEA method follows the standard approach used by both U.S. EPA and Cal/EPA for assessing theoretical risks to human health. PEA (DTSC, 1999) equations for calculating risks to default residential receptors from exposure to soil were used in this assessment. PEA equations combine the assumptions of exposure with COPC toxicity information. COPCs identified are non-volatile compounds. The PEA's estimation equation for air concentrations for non-VOCs is therefore used.

Soil

The PEA equation for hazards and risks associated with soil is as follows:

$$Hazard_{soil} = ((C_s / RfD_o) \times (1.28 \times 10^{-5})) + ((C_s / RfD_o) \times (1.28 \times 10^{-4}) \times ABS)$$

$$Risk_{soil} = (C_s \times SF_o \times (1.57 \times 10^{-6})) + (C_s \times SF_o \times (1.87 \times 10^{-5}) \times ABS)$$

where:

C_s	=	Soil concentration (mg/kg)
RfD_o	=	Oral reference dose (mg/kg-day)
1.28×10^{-5}	=	Non-cancer incidental soil ingestion exposure factor (day^{-1})
1.28×10^{-4}	=	Non-cancer dermal contact exposure factor (day^{-1})
ABS	=	Dermal absorption fraction (unitless)
SF_o	=	Oral cancer slope factor $(mg/kg\text{-}day)^{-1}$
1.57×10^{-6}	=	Carcinogenic incidental soil ingestion exposure factor (day^{-1})
1.87×10^{-5}	=	Carcinogenic soil dermal contact exposure factor (day^{-1})

Air

The PEA equation for hazards and risks associated with air is as follows:

$$Hazard_{air} = (C_a / RfD_i) \times 0.639$$
$$Risk_{air} = (C_a \times SF_i \times 0.149)$$

where:

C_a	=	air concentration (mg/m^3)
RfD_i	=	Inhalation reference dose (mg/kg-day)
SFi	=	Inhalation slope factor (mg/kg-day)

C_a, the air concentration term for non-volatile compounds is defined as:

$$C_{air} = (C_s \times 5 \times 10^{-8} kg / m^3)$$

where:

5×10^{-8}	=	National ambient air quality standard for dust (kg/m^3)

5.2 Methods for Assessing Non-Cancer Health Effects

The PEA approach generates a non-cancer hazard quotient for each pathway of exposure for a default residential child. If a person's average exposure is less than the RfD (that is, if the hazard quotient is less than one), the chemical is considered unlikely to pose a significant non-carcinogenic health hazard to individuals under the given exposure conditions. Unlike carcinogenic risk estimates, a hazard quotient is not expressed as a probability. Therefore, while both cancer and non-cancer risk characterizations indicate a relative potential for adverse effects to occur from exposure to a chemical, a non-cancer adverse health effect's estimate is not directly comparable with a cancer risk estimate.

The hazard quotients for each pathway are summed to determine whether exposure to a combination of pathways poses a health concern. This sum of the hazard quotients is known as a hazard index.

$$Hazard\ Index = \sum Hazard\ Quotients$$

5.3 Methods for Assessing Cancer Risks

In the risk characterization, carcinogenic risk is estimated as the incremental probability of an individual developing cancer over a lifetime as a result of a chemical exposure. Because cancer risks are averaged over a person's lifetime, longer-term exposure to a carcinogen will result in higher risks than shorter-term exposure to the same carcinogen, if all other exposure assumptions are constant. The PEA approach generates a cancer risk estimate for each pathway of exposure for the default age-adjusted resident.

Theoretical risk associated with low levels of exposure in humans is assumed directly related to an observed cancer incidence associated with high levels of exposure in animals. According to U.S. EPA (1989), this approach is appropriate for theoretical upper-bound incremental lifetime cancer risks of less than 1×10^{-2}. The following equation was used to calculate chemical-specific, pathway-specific, and total risks:

$$\textit{Total Carcinogenic Risk} = \Sigma \textit{Individual Chemical and Pathway Specific Risks}$$

This assessment assumes that cancer risks from various exposure pathways are additive. Thus, the result of the assessment is a high-end estimate of the total carcinogenic risk. High-end carcinogenic risk estimates are compared to the range of 10^{-6} to 10^{-4} used as the acceptable risk by the USEPA for Superfund Cleanup Sites. A risk level of 1×10^{-6} represents the "Bright Line" probability goal of one in one million that an individual could develop cancer from exposure to the potential carcinogen under a *defined set of exposure assumptions*. (Exposure parameters used in this risk assessment are summarized in Table C-5). If the estimated risk falls below this risk value ($<10^{-6}$) the chemical is generally considered unlikely to pose a significant carcinogenic health risk to individuals under the given exposure conditions.

5.4 Human Health Screening Results

Table C-6 presents a summary of the hazard/risk calculations using the maximum detected COPC concentrations as EPCs. Based on the use of the PEA methodology and using the highest identified organic COPC concentrations and the highest detected arsenic concentration as EPCs, the non-cancer hazard index for a residential child receptor on the subject property results in a Hazard Index number of **4.0**, and a calculated theoretical upper-bound incremental lifetime cancer risk of **1.4×10^{-3}**.

Table C-7a presents a summary of the hazard/risk calculations using the 95 % UCL of the arithmetic means of the detected COPC concentrations as EPCs. Using this approach, the non-cancer hazard index for a residential child receptor on the subject property results in a Hazard Index number of **1.4**, and a calculated theoretical upper-bound incremental lifetime cancer risk of $\mathbf{4.8 \times 10^{-4}}$. Table C-7b provides the supporting statistical analysis for Table C-7a.

Lead

An evaluation of lead in soil from Mitigation Area 1 indicated six of the ten samples exceeding the Residential CHHSL for lead (150 mg/mg). Table C-8 shows the results of the Leadspread calculation using the maximum site lead concentration on the site (300 mg/kg). The resulting blood lead concentration for a child at the 99th percentile (15.8 µg/dL) clearly exceeds the blood lead level value of 10 µg/dL used by the DTSC. However, as shown on Table C-9a, using the more representative lead concentration value of 132 mg/kg, based on the 95% UCL of the arithmetic mean of the total site lead concentration values, yields a value of 9.5 µg/dL child blood lead at the 99th percentile. This value falls acceptably within the DTSC's screening value for child blood lead. Table C-9b provides the supporting statistical analysis for Table C-9a.

5.5 Uncertainty Analysis

A health risk assessment is not intended to estimate actual health risks to a person or population in conjunction with exposure to chemicals in the environment. Estimating actual risks is unlikely because of the multitude and variability of factors potentially affecting the exposed or potentially exposed populations. This is especially true of the PEA process, which is designed only to give risk managers enough screening-level information to decide whether additional site characterization, a detailed risk assessment, mitigation, or no further action is required. Therefore, risk assessment is a means of estimating the probability that an adverse health effect (for example, cancer) will occur in a person or population at some point in the future. Risk estimates are not likely to underestimate real risk due to the numerous conservative assumptions used in the process.

Risk estimates are calculated by combining site data, assumptions about the potential exposures to impacted media, and toxicity data. As with any type of risk-based analysis, uncertainties exist because of the assumptions used throughout the process. These

assumptions are conservative, meaning that they are more likely to over-predict rather than under-predict the risks associated with a site.

The selection of exposure pathways is based on the potential for actual exposure. Based on the potential exposure pathways evaluated with ultraconservative exposure assumptions, it is evident that existing concentrations of COPCs on the subject property within certain identifiable areas could potentially result in adverse health effects.

6.0 CLEANUP GOAL & SCREENING LEVEL RATIONALE

A human health risk screening of the subject property shows that the theoretical upper-bound incremental lifetime cancer risk for future potential receptors at the subject property exceeds the desired risk range (10^{-6} to 10^{-4}) used by the U.S. EPA as acceptable risk for Superfund Cleanup Sites. The resident child hazard index within portions of the site also exceeds the maximum acceptable non-cancer index of 1.0 when maximum concentrations are used as EPCs (Table C-6). Figure 4 in the body of the RAW presents an Arsenic Concentration Map showing the locations of site samples collected with emphasis on arsenic and a 16.0 mg/kg isocontour line used as a preliminary screening number to delineate elevated arsenic concentrations. Figure 5 in the body of the RAW shows the location of OCP concentrations detected on the site.

Previous site sampling and analysis yielded mean and maximum background arsenic concentrations of 2.1 and 4.4 mg/kg respectively. Current shallow surface site sampling and analysis yielded overall site mean and maximum values of 15.6 and 68 mg/kg respectively.

An arsenic cleanup goal of 8 mg/kg at the 95% UCL for the overall site was conservatively established following derivation of an arsenic cleanup goal in accordance with the DTSC guidance document titled *Arsenic Strategies: Determination of Arsenic Remediation Development of Arsenic Cleanup Goals for Proposed and Existing School Sites (DTSC, 2007).* Option 2 methodology was utilized in accordance with the referenced guidance, which provides for development of cleanup goals using site specific data, and an approach incorporating both visual evaluation of the data plots (graphical evaluation) and statistical calculations (statistical evaluation). These evaluations are presented below.

6.1 Graphical Evaluation

Step 1 of this evaluation is the creation of normality plots. Summary statistics and graphic plots are provided for both non-transformed and log transformed data in Exhibits C-1 and C-2 respectively.

Inspection of the **non-transformed data** Exhibit C-1 normality plot reveals numerous slope changes suggesting multiple statistical populations in the data set. Using an argument similar to that presented in the DTSC guidance (Figure 1), data in the range from approximately 2.5 mg/kg through 9 mg/kg present the appearance of a normally distributed and linear distribution. This linear portion of the curve would potentially representative of ambient site arsenic. A concentration of **9.0 mg/kg** would represent the upper-bound of ambient arsenic in soil ant the site and would serve as a potential cleanup goal.

Using an argument similar to that presented in the DTSC guidance (Figure 1), inspection of the **transformed data** Exhibit C-2 normality plot reveals that data in the range from approximately 0.8 through 1.15 (6.3 mg/kg to 14 mg/kg) present the appearance of a normally distributed and linear distribution. By this plot, a concentration of **14 mg/kg** would represent the upper-bound of ambient arsenic in soil ant the site and would serve as a potential cleanup goal.

6.2 Statistical Evaluation

As suggested in the DTSC arsenic guidance, by both plot (Exhibit C-1) and fourth spread method, data outliers were determined on the raw data. Values exceeding 48.75 may be considered outliers. No data point outliers were identified on the lower end of the data set. The underlying data distribution however remains nonparametric. Exhibit C-3 presents a data summary without outliers. The recommended nonparametric UCL in this summary is the 97.5th Chebyshev [mean, standard deviation] UCL of **20.66 mg/kg**.

A final statistical evaluation of arsenic distribution on the subject property (Exhibit C-4) shows that concentrations in the range of minimum detected site arsenic to a maximum value of 15 mg/kg appear lognormal at 5% Significance. This suggests the potential of a single ambient population group with a reasonable expectation of **15 mg/kg** as the upper end of potential ambient site arsenic concentration.

Moreover, given the ultraconservative exposure assumptions inherent in the hazard/risk analyses, which does not take into account the hardscape features (buildings, roads, parking lots), and landscape design that will reduce actual exposure opportunities, a cleanup goal on the order of 16 mg/kg for the subject property would likely provide an appropriate level of protectiveness for future site occupants.

6.3 Cleanup Goal Summary

On the basis of the evaluations described above, WKA proposes a removal action for site areas containing elevated levels of COPCs, using arsenic as the primary driver and indicator for areas of site contamination. WKA recommends a cleanup screening level of **16 mg/kg** arsenic concentration, which may be expected to yield an overall site arsenic cleanup goal concentration value of approximately **8 mg/kg** at the 95% UCL of the arithmetic mean. This value, while higher than directly detected background site concentration, is in conservative conformance with ambient background levels determined by methods approved by the DTSC and the scientific community.

APPENDIX C

TABLES

Table C-1
Penryn Property
SSI II

Summary of Site Water Analyses
(µg/L)

Sample Identification	Sample Date	Metals*										OCPs	
		Arsenic	Barium	Cobalt	Chromium	Copper	Lead	Nickel	Vanadium	Zinc	Mercury	DDE	DDT
WS-1	2/17/06	<5.0	**40**	<20	<20	<20	<5.0	<20	<20	**41.0**	<0.20	<0.10	<0.10
WS-2	2/17/06	<5.0	**23**	<20	<20	<20	<5.0	<20	<20	<20	<0.20	<0.10	<0.10
Wtr-E1	7/19/07	<2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.10	<0.10
Wtr-E2	8/10/07	**5.0**	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.10	<0.10
RN-1	7/19/07	<2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.10	<0.10
ESL		36.0	1,000	3.0	180	3	2.5	8.2	1.5	81.0	0.012		
NRWQC												1.1**	

Notes:

OCPs - Organochlorine Pesticides Analysis by EPA Meth 200.8
Metals Analyses by EPA Method 200.7; 200.8; or 245.1
* - This table presents only those CAM-17 metals and OCP compounds detected in these samples.
µg/L - microgram per liter
RN-1 - Rinsate QA/QC sample
NA - Not analyzed for this parameter
ESL - Environmental Screening Level (CRWQCB, 2005)
NRWQC - National Recommended Water Quality Criteria for Priority Pollutants (EPA, 2006)
** This criterion applies to the sum of DDT and its metabolites.

Table C-2

Penryn Property

Site Data Evaluation Summary
SSI I

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Min. Non-Detect	Max. Non-Detect	Soils												CHHSL
						Site Soil Analyses						Site Background						
						Min.	Mean	Max.	Std. Dev.	Distribution*	95% UCL	Min.	Mean	Max.	Std. Dev.	Distribution	95% UCL	
Organochlorine Pesticides (µg/kg)																		
DDE	30	21	70%	75	75	77	389	1,900	464	Nonparametric	562.0	NA	NA	NA	NA	NA	NA	2,300.00
DDT	30	8	27%	75	75	94	135	820	209	Nonparametric	213.5	NA	NA	NA	NA	NA	NA	1,600.00
Endrin	30	4	13%	75	75	85	48	170	30	Nonparametric	59.2	NA	NA	NA	NA	NA	NA	2,100.00
Methoxychlor	30	2	7%	75	75	88	42	130	19	Nonparametric	49.3	NA	NA	NA	NA	NA	NA	340,000.00
Metals (mg/kg)																		
Arsenic	142	140	99%	<0.5	<1.0	0.6	14.5	68.0	16.10	Nonparametric	22.9	0.6	2.1	4.4	1.72	Normal	3.90	0.07
Selenium	6	0	0%	1.0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380
Thallium	6	0	0%	1.0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5
Antimony	6	0	0%	2.5	2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	30
Barium	6	6	100%	NA	NA	47	63.7	86.0	16.9	Normal	81.4	23.00	43.17	100	29.15	Lognormal	73.8	5,200
Beryllium	6	0	0%	0.5	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	150
Cadmium	6	0	0%	0.5	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.7
Cobalt	6	6	100%	NA	NA	6.2	7.7	9.0	0.918	Normal	8.61	3.4	10.32	23	6.93	Normal	17.58	660
Chromium	6	6	100%	NA	NA	22	27.7	31.0	3.27	Normal	31.09	23	44.17	62	15.92	Normal	60.87	100,000**
Copper	6	6	100%	NA	NA	12	21.0	28.0	5.7	Normal	27.01	16	35.33	58	16.71	Normal	52.56	3,000
Lead	16	15	94%	2.5	2.5	2.6	43.3	230.0	60.9	Nonparametric	75.76	1.25	9.56	26	12.36	Lognormal	22.53	150
Molybdenum	6	0	0%	1.0	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380
Nickel	6	6	100%	NA	NA	10	14.5	17.0	2.59	Normal	17.22	0.54	17.02	28	10.23	Normal	27.76	1,600
Silver	6	0	0%	0.50	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380.00
Vanadium	6	6	100%	NA	NA	23	28.2	32.0	3.1	Normal	31.38	37	47.67	57	8.62	Normal	56.70	530
Zinc	6	6	100%	NA	NA	14	30.9	44.0	5.2	Normal	34.08	12	28.5	41	10.93	Normal	39.97	23,000
Mercury	6	1	17%	0.10	0.10	0.3	NA	0.3	8.9	Nonparametric	38.74	0.05	0.058	0.1	0.02	Nonparametric	0.08	18

Notes:

NA - not applicable
UCL - Upper Confidence Limit
mg/kg - milligram per kilogram
µg/kg - micrograms per kilogram
UCL - Upper Confidence Limit
Only shallow surface ("a" interval) soil samples (and background soil samples) are included in this data evaluation table
For metals detected in some samples but not in others, a value of one-half the reporting level concentration (unbolded number) was used to calculate descriptive statistics of those sample concentrations not detected above the mentod reporting limit.
CHHSL - California Human Health Screening Level for Residential Land Use (DTSC, 2005)

Table C-3
Penryn Property

Site Data Evaluation Summary
SSI II

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Min. Non-Detect	Max. Non-Detect	Soils												CHHSL
						Site Soil Analyses						Site Background						
						Min.	Mean	Max.	Std. Dev.	Distribution*	95% UCL	Min.	Mean	Max.	Std. Dev.	Distribution	95% UCL	
Organochlorine Pesticides (µg/kg)																		
DDD	38	1	3%	75	75	100	NA	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	2,300.00
DDE	38	29	76%	75	75	77	650	2,700	717	Gamma	910.0	NA	NA	NA	NA	NA	NA	1,600.00
DDT	38	16	42%	75	75	94	319	2,500	505	Nonparametric	1,114.0	NA	NA	NA	NA	NA	NA	1,600.00
Endrin	38	4	11%	75	75	85	45	170	26	Nonparametric	52.4	NA	NA	NA	NA	NA	NA	2,100.00
Methoxychlor	38	2	5%	75	75	88	41	130	17	Nonparametric	45.5	NA	NA	NA	NA	NA	NA	340,000.00
Metals (mg/kg)																		
Arsenic	165	163	99%	<0.5	<1.0	0.6	15.6	68.0	16.70	Nonparametric	23.8	0.6	2.1	4.4	1.72	Normal	3.90	0.07
Selenium	6	0	0%	1.0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380
Thallium	6	0	0%	1.0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5
Antimony	6	0	0%	2.5	2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	30
Barium	6	6	100%	NA	NA	47	63.7	86.0	16.9	Normal	81.4	23.00	43.17	100	29.15	Lognormal	73.8	5,200
Beryllium	6	0	0%	0.5	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	150
Cadmium	6	0	0%	0.5	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.7
Cobalt	6	6	100%	NA	NA	6.2	7.7	9.0	0.918	Normal	8.61	3.4	10.32	23	6.93	Normal	17.58	660
Chromium	6	6	100%	NA	NA	22	27.7	31.0	3.27	Normal	31.09	23	44.17	62	15.92	Normal	60.87	100,000**
Copper	6	6	100%	NA	NA	12	21.0	28.0	5.7	Normal	27.01	16	35.33	58	16.71	Normal	52.56	3,000
Lead	25	15	60%	2.5	2.5	2.6	43.3	230.0	60.9	Nonparametric	75.76	1.25	9.56	26	12.36	Lognormal	22.53	150
Molybdenum	6	0	0%	1.0	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380
Nickel	6	6	100%	NA	NA	10	14.5	17.0	2.59	Normal	17.22	0.54	17.02	28	10.23	Normal	27.76	1,600
Silver	6	0	0%	0.50	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380.00
Vanadium	6	6	100%	NA	NA	23	28.2	32.0	3.1	Normal	31.38	37	47.67	57	8.62	Normal	56.70	530
Zinc	6	6	100%	NA	NA	14	30.9	44.0	5.2	Normal	34.08	12	28.5	41	10.93	Normal	39.97	23,000
Mercury	6	1	17%	0.10	0.10	0.3	NA	0.3	8.9	Nonparametric	38.74	0.05	0.058	0.1	0.02	Nonparametric	0.08	18

Notes:

NA - not applicable
UCL - Upper Confidence Limit
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
UCL - Upper Confidence Limit
Only shallow surface ("a" interval) soil samples (and background soil samples) are included in this data evaluation table
For metals detected in some samples but not in others, a value of one-half the reporting level concentration (unbolded number) was used to calculate descriptive statistics of those sample concentrations not detected above the mentod reporting limit.
CHHSL - California Human Health Screening Level for Residential Land Use (DTSC, 2005)

Table C-4
Penryn Property

Toxicity Criteria of COPCs

COPC	Oral RfD[a] (mg/kg-d)	Oral CSF[b] $(mg/kg-d)^{-1}$	Inhalation RfD[c] (mg/kg-d)	Inhalation CSF[b] $(mg/kg-d)^{-1}$	Cancer Weight of Evidence*	Oral Bio[d]	Dermal ABS[e]
Arsenic	3.00E-04	9.5	3.00E-04	12.0	A	1.0	0.03
DDE	5.0×10^{-4}	3.4×10^{-1}[b]	5×10^{-4}	3.4×10^{-1}	B2	1.0	0.05
DDT	5.0×10^{-4}	3.4×10^{-1}[b]	5×10^{-4}	3.4×10^{-1}	B2	1.0	0.05
Endrin	3.0×10^{-4}	na	3.0×10^{-4}	na	D	1.0	0.05
Methoxychlor	5.0×10^{-3}	na	5.0×10^{-3}	na	D	1.0	0.05
Lead **	na	na	na	na	na	na	na

Notes:
RFD - Reference Dose
CSF - Cancer Slope Factor
[a]U.S. EPA IRIS Database, March 2006 (http://www.epa.gov/iris/)
[b]From OEHHA (1994) and OEHHA database (2003; http://www.oehha.ca.gov/risk/chemicalDB/index.asp).
[c]Route to route extrapolation from inhalation reference concentration (RfC) criteria. Criteria provided by U.S. EPA
RfC (mg/m^3) X (20 m^3/day / 70kg)
[d]Oral bioavailability
[e]Dermal absorption obtained from DTSC (1994).
*Cancer Weight of Evidence
A - Established human carcinogen
B2 - indicates sufficient evidence in animals but inadequate or no evidence in hu
** Lead is evaluated separately via the Leadspread7 Model
na - not applicable

Table C-5
Penryn Property

Exposure Parameters

Acronym	Description	Value	Units	Reference
ABS	dermal absorption efficiency	Chemical specific	unitless	See text
AF	adherence factor for the child	0.2	mg/cm^2	DTSC (2000)
AF_{adult}	adherence factor for the adult	0.07	mg/cm^2	DTSC (2000)
AT_c	averaging time – carcinogens	25,550	days	DTSC (1994)
AT_{nc}	averaging time – noncarcinogens	2190	days	DTSC (1994)
BW	child body weight	15	kg	DTSC (1994)
BW_{adult}	adult body weight	70	kg	DTSC (1994)
CSF_i	cancer slope factor – inhalation route	Chemical specific	$(mg/kg/day)^{-1}$	See text
CSF_o	cancer slope factor – oral route	Chemical specific	$(mg/kg/day)^{-1}$	See text
ED	exposure duration	6	years	DTSC (1994)
EF	exposure frequency	350	days/year	DTSC (2000)
HQ	hazard quotient	1	unitless	
IRA	child inhalation rate	10	m^3/day	DTSC (1994)
IRA_{adult}	adult inhalation rate	20	m^3/day	DTSC (1994)
IRA_{adj}	age-adjusted inhalation rate	11	$(m^3*yr)/(kg*day)$	USEPA (2002)
IRS	child soil ingestion rate	200	mg/day	DTSC (1994)
IRS_{adult}	adult soil ingestion rate	100	mg/day	DTSC (1994)
IRS_{adj}	age-adjusted ingestion rate of soil	114	(mg*yr)/(kg*day)	USEPA (2002)
PEF	particulate inhalation factor	1.32E+09	m^3/kg	USEPA (2002)
RfD_i	reference dose – inhalation route	Chemical specific	mg/kg/day	See text
RfD_o	reference dose – oral route	Chemical specific	mg/kg/day	See text
SA	child skin surface area	2,900	cm^2	DTSC (2000)
SA_{adult}	adult skin surface area	5,700	cm^3	DTSC (2000)
SA_{adj}	age-adjusted skin surface area	369	(mg*yr)/(kg*day)	USEPA (2002), DTSC (2000)
TR	target risk	1.00E-06	unitless	

Table C-6
Penryn Property

SSI I I
Hazard/Risk Evaluation
Maximum Site Conentrations of COPCs

Constituent of Concern	EPC* (mg/kg)	Air (Non-Voc) Concentration(C_a) (mg/m^3)	ABS	Oral + Dermal				Inhalation			
				RfD_o	CSF_o	Soil		RfD_i	CSF_i	Air-Non-VOC	
				(mg/kg-d)	$(mg/kg-d)^{-1}$	HQ	Risk	(mg/kg-d)	$(mg/kg-d)^{-1}$	HQ	Risk
Arsenic	68.0	3.40E-06	0.03	3.00E-04	9.5E+00	3.8E+00	1.4E-03	3.0E-04	1.2E+01	7.24E-03	6.08E-06
DDE	2.7	1.35E-07	0.05	5.00E-04	3.4E-01	1.0E-01	2.3E-06	5.0E-04	3.4E-01	1.73E-04	6.84E-09
DDT	2.5	1.25E-07	0.05	5.00E-04	3.4E-01	9.6E-02	2.1E-06	5.0E-04	3.4E-01	1.60E-04	6.33E-09
Methoxychlor	0.13	6.50E-09	0.05	5.00E-03	0.00E+00	5.0E-04	0.0E+00	5.0E-03	0.00E+00	8.31E-07	0.00E+00
Endrin	0.17	8.50E-09	0.05	3.00E-04	0.00E+00	1.1E-02	0.00E+00	3.00E-04	0.00E+00	1.81E-05	0.00E+00
					Sub-Total	4.0E+00	1.4E-03			7.6E-03	6.1E-06

	Hazard Index	Incremental Lifetime Cancer Risk
Total	4.0E+00	1.4E-03

Notes:

* Exposure Point Concentration = maximum site conentrations of COPCs

Soil Hazard Equations

$Hazard_{soil}$ = ((Cs/RfDo) x (1.28 x 10-5)) + ((Cs/RfDo) x (1.28 x 10-4)) x ABS

$Hazard_{air}$ = (Cs/Rfdi) x 0.639

Soil Risk Equations

$Risk_{soil}$ = (Sfo x Cs x (1.57 x 10-6)) + (Sfo x Cs x (1.87 x 10-5) x ABS)

$Risk_{air}$ = Sfi x Cs x 0.149

Where:

Sf_o = oral cancer slope factor (mg/kg-day)-1

Sf_i = inhalation cancer slope factor (mg/kg-day)-1

C_s = concentration in soil, mg/kg

C_a = concentration in air, mg/kg

RfD_o = oral reference dose, in units of mg/kg-day

RfD_i = inhalation reference dose, in units of mg/kg-day

ABS = absorption fraction (dimensionless)

Table C-7a
Penryn Property

SSI II
Hazard/Risk Evaluation
95% UCL of Arithmetic Mean of COPCs

Constituent of Concern	EPC*	Air (Non-Voc) Concentration(C_a) (mg/m^3)	ABS	Oral + Dermal				Inhalation			
				RfD_o	CSF_o	Soil		RfD_i	CSF_i	Air-Non-VOC	
				(mg/kg-d)	$(mg/kg-d)^{-1}$	HQ	Risk	(mg/kg-d)	$(mg/kg-d)^{-1}$	HQ	Risk
Arsenic	23.8	1.19E-06	0.03	3.00E-04	9.5E+00	1.3E+00	4.8E-04	3.0E-04	1.2E+01	2.53E-03	2.13E-06
DDE	0.91	4.55E-08	0.05	5.00E-04	3.4E-01	3.5E-02	7.8E-07	5.0E-04	3.4E-01	5.81E-05	2.31E-09
DDT	1.114	5.57E-08	0.05	5.00E-04	3.4E-01	4.3E-02	9.5E-07	5.0E-04	3.4E-01	7.12E-05	2.82E-09
Methoxychlor	0.0455	2.28E-09	0.05	5.00E-03	0.00E+00	1.7E-04	0.0E+00	5.0E-03	0.00E+00	2.91E-07	0.00E+00
Endrin	0.0524	2.62E-09	0.05	3.00E-04	0.00E+00	3.4E-03	0.00E+00	3.00E-04	0.00E+00	5.58E-06	0.00E+00
					Sub-Total	1.4E+00	4.8E-04			2.7E-03	2.1E-06

	Hazard Index	Incremental Lifetime Cancer Risk
Total	1.4E+00	4.8E-04

Notes:

* Exposure Point Concentration = 95%UCL of arithmetic mean of COPCs

Soil Hazard Equations

$Hazard_{soil}$ = ((Cs/RfDo) x (1.28 x 10-5)) + ((Cs/RfDo) x (1.28 x 10-4)) x ABS

$Hazard_{air}$ = (Cs/Rfdi) x 0.639

Soil Risk Equations

$Risk_{soil}$ = (Sfo x Cs x (1.57 x 10-6)) + (Sfo x Cs x (1.87 x 10-5) x ABS)

$Risk_{air}$ = Sfi x Cs x 0.149

Where:

Sf_o = oral cancer slope factor (mg/kg-day)-1

Sf_i = inhalation cancer slope factor (mg/kg-day)-1

C_s = concentration in soil, mg/kg

C_a = concentration in air, mg/kg

RfD_o = oral reference dose, in units of mg/kg-day

RfD_i = inhalation reference dose, in units of mg/kg-day

ABS = absorption fraction (dimensionless)

Table C-7b
Penryn Property

Supporting Statistics for
Table C-7a

Data File		Variable:	Penryn site As SSI II
Raw Statistics		**Normal Distribution Test**	
Number of Valid Samples	165	Lilliefors Test Statisitic	0.177349
Number of Unique Samples	88	Lilliefors 5% Critical Value	0.068975
Minimum	0.25	Data not normal at 5% significance level	
Maximum	68		
Mean	15.66212	95% UCL (Assuming Normal Distribution)	
Median	8.8	Student's-t UCL	17.80661
Standard Deviation	16.65249		
Variance	277.3055	Gamma Distribution Test	
Coefficient of Variation	1.063234	A-D Test Statistic	2.979441
Skewness	1.181073	A-D 5% Critical Value	0.790953
		K-S Test Statistic	0.117061
Gamma Statistics		K-S 5% Critical Value	0.075267
k hat	0.849237	Data do not follow gamma distribution	
k star (bias corrected)	0.837837	at 5% significance level	
Theta hat	18.44258		
Theta star	18.69352	95% UCLs (Assuming Gamma Distribution)	
nu hat	280.2482	Approximate Gamma UCL	18.121
nu star	276.4861	Adjusted Gamma UCL	18.14411
Approx.Chi Square Value (.05)	238.9691		
Adjusted Level of Significance	0.048545	Lognormal Distribution Test	
Adjusted Chi Square Value	238.6648	Lilliefors Test Statisitic	0.097967
		Lilliefors 5% Critical Value	0.068975
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	-1.386294		
Maximum of log data	4.219508	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	2.057791	95% H-UCL	23.11688
Standard Deviation of log data	1.294206	95% Chebyshev (MVUE) UCL	28.35361
Variance of log data	1.674968	97.5% Chebyshev (MVUE) UCL	32.86698
		99% Chebyshev (MVUE) UCL	41.73263
		95% Non-parametric UCLs	
		CLT UCL	17.7945
		Adj-CLT UCL (Adjusted for skewness)	17.92187
		Mod-t UCL (Adjusted for skewness)	17.82648
		Jackknife UCL	17.80661
		Standard Bootstrap UCL	17.81428
		Bootstrap-t UCL	17.98457
RECOMMENDATION		Hall's Bootstrap UCL	18.04554
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	17.77879
		BCA Bootstrap UCL	17.86545
Use 97.5% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	21.31298
		97.5% Chebyshev (Mean, Sd) UCL	23.7581
		99% Chebyshev (Mean, Sd) UCL	28.56109

Table C-8
Penryn Property

Maximum Lead Concentration

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

USER'S GUIDE to version 7

INPUT	
MEDIUM	LEVEL
Lead in Air (ug/m^3)	0.028
Lead in Soil/Dust (ug/g)	300.0
Lead in Water (ug/l)	15
% Home-grown Produce	7%
Respirable Dust (ug/m^3)	1.5

OUTPUT	Percentile Estimate of Blood Pb (ug/dl)					PRG-99	PRG-95
	50th	90th	95th	98th	99th	(ug/g)	(ug/g)
BLOOD Pb, ADULT	2.1	3.8	4.5	5.5	6.3	676	1063
BLOOD Pb, CHILD	5.3	9.7	11.4	13.9	15.8	146	247
BLOOD Pb, PICA CHILD	7.4	13.5	16.0	19.4	22.1	94	159
BLOOD Pb, OCCUPATION	1.3	2.4	2.8	3.4	3.9	3475	5464

EXPOSURE PARAMETERS	units	adults	children
Days per week	days/wk	7	
Days per week, occupational		5	
Geometric Standard Deviation		1.6	
Blood lead level of concern (ug/dl)		10	
Skin area, residential	cm^2	5700	2900
Skin area occupational	cm^2	2900	
Soil adherence	ug/cm^2	70	200
Dermal uptake constant	(ug/dl)/(ug/da	0.0001	
Soil ingestion	mg/day	50	100
Soil ingestion, pica	mg/day		200
Ingestion constant	(ug/dl)/(ug/da	0.04	0.16
Bioavailability	unitless	0.44	
Breathing rate	m^3/day	20	6.8
Inhalation constant	(ug/dl)/(ug/da	0.08	0.19
Water ingestion	l/day	1.4	0.4
Food ingestion	kg/day	1.9	1.1
Lead in market basket	ug/kg	3.1	
Lead in home-grown produce	ug/kg	135.0	

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PATHWAYS

ADULTS	Residential			Occupational		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	3.8E-5	0.01	1%	1.4E-5	0.00	0%
Soil Ingestion	8.8E-4	0.26	13%	6.3E-4	0.19	15%
Inhalation, bkgrnd		0.05	2%		0.03	3%
Inhalation	2.5E-6	0.00	0%	1.8E-6	0.00	0%
Water Ingestion		0.84	40%		0.84	65%
Food Ingestion, bkgrnd		0.22	10%		0.23	18%
Food Ingestion	2.4E-3	0.72	34%			0%

CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.6E-5	0.02	0%		0.02	0%
Soil Ingestion	7.0E-3	2.11	40%	1.4E-2	4.22	57%
Inhalation	2.0E-6	0.00	0%		0.00	0%
Inhalation, bkgrnd		0.04	1%		0.04	0%
Water Ingestion		0.96	18%		0.96	13%
Food Ingestion, bkgrnd		0.50	9%		0.50	7%
Food Ingestion	5.5E-3	1.66	31%		1.66	22%

Table C-9a
Penryn Property

95% UCL of Arithmetic Mean

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

USER'S GUIDE to version 7

INPUT	
MEDIUM	LEVEL
Lead in Air (ug/m^3)	0.028
Lead in Soil/Dust (ug/g)	132.0
Lead in Water (ug/l)	15
% Home-grown Produce	7%
Respirable Dust (ug/m^3)	1.5

OUTPUT							
	Percentile Estimate of Blood Pb (ug/dl)					PRG-99	PRG-95
	50th	90th	95th	98th	99th	(ug/g)	(ug/g)
BLOOD Pb, ADULT	1.5	2.8	3.3	4.0	4.6	676	1063
BLOOD Pb, CHILD	3.2	5.8	6.8	8.3	9.5	146	247
BLOOD Pb, PICA CHILD	4.1	7.5	8.9	10.8	12.2	94	159
BLOOD Pb, OCCUPATION	1.2	2.2	2.6	3.1	3.6	3475	5464

EXPOSURE PARAMETERS			
	units	adults	children
Days per week	days/wk	7	
Days per week, occupational		5	
Geometric Standard Deviation		1.6	
Blood lead level of concern (ug/dl)		10	
Skin area, residential	cm^2	5700	2900
Skin area occupational	cm^2	2900	
Soil adherence	ug/cm^2	70	200
Dermal uptake constant	(ug/dl)/(ug/da	0.0001	
Soil ingestion	mg/day	50	100
Soil ingestion, pica	mg/day		200
Ingestion constant	(ug/dl)/(ug/da	0.04	0.16
Bioavailability	unitless	0.44	
Breathing rate	m^3/day	20	6.8
Inhalation constant	(ug/dl)/(ug/da	0.08	0.19
Water ingestion	l/day	1.4	0.4
Food ingestion	kg/day	1.9	1.1
Lead in market basket	ug/kg	3.1	
Lead in home-grown produce	ug/kg	59.4	

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PATHWAYS						
ADULTS	Residential			Occupational		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	3.8E-5	0.01	0%	1.4E-5	0.00	0%
Soil Ingestion	8.8E-4	0.12	8%	6.3E-4	0.08	7%
Inhalation, bkgrnd		0.05	3%		0.03	3%
Inhalation	2.5E-6	0.00	0%	1.8E-6	0.00	0%
Water Ingestion		0.84	55%		0.84	71%
Food Ingestion, bkgrnd		0.22	14%		0.23	20%
Food Ingestion	2.4E-3	0.32	21%			0%

CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.6E-5	0.01	0%		0.01	0%
Soil Ingestion	7.0E-3	0.93	29%	1.4E-2	1.86	45%
Inhalation	2.0E-6	0.00	0%		0.00	0%
Inhalation, bkgrnd		0.04	1%		0.04	1%
Water Ingestion		0.96	30%		0.96	23%
Food Ingestion, bkgrnd		0.50	16%		0.50	12%
Food Ingestion	5.5E-3	0.73	23%		0.73	18%

Table C-9b
Penryn Property

Supporting Statistics for
Table C-9a

Data File		Variable:	Pb SSI II
Raw Statistics		Normal Distribution Test	
Number of Valid Samples	21	Shapiro-Wilk Test Statisitic	0.788792
Number of Unique Samples	21	Shapiro-Wilk 5% Critical Value	0.908
Minimum	1.3	Data not normal at 5% significance level	
Maximum	300		
Mean	75.92381	95% UCL (Assuming Normal Distribution)	
Median	30	Student's-t UCL	110.6222
Standard Deviation	92.1935		
Variance	8499.642	Gamma Distribution Test	
Coefficient of Variation	1.21429	A-D Test Statistic	0.456024
Skewness	1.287629	A-D 5% Critical Value	0.794543
		K-S Test Statistic	0.13779
Gamma Statistics		K-S 5% Critical Value	0.198715
k hat	0.619571	Data follow gamma distribution	
k star (bias corrected)	0.562807	at 5% significance level	
Theta hat	122.5425		
Theta star	134.902	95% UCLs (Assuming Gamma Distribution)	
nu hat	26.022	Approximate Gamma UCL	132.2347
nu star	23.6379	Adjusted Gamma UCL	138.194
Approx.Chi Square Value (.05)	13.57193		
Adjusted Level of Significance	0.0383	Lognormal Distribution Test	
Adjusted Chi Square Value	12.98667	Shapiro-Wilk Test Statisitic	0.948597
		Shapiro-Wilk 5% Critical Value	0.908
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	0.262364		
Maximum of log data	5.703782	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	3.337153	95% H-UCL	416.2721
Standard Deviation of log data	1.657167	95% Chebyshev (MVUE) UCL	284.5157
Variance of log data	2.746202	97.5% Chebyshev (MVUE) UCL	365.5726
		99% Chebyshev (MVUE) UCL	524.7931
		95% Non-parametric UCLs	
		CLT UCL	109.0154
		Adj-CLT UCL (Adjusted for skewness)	115.0556
		Mod-t UCL (Adjusted for skewness)	111.5643
		Jackknife UCL	110.6222
		Standard Bootstrap UCL	107.8474
		Bootstrap-t UCL	119.7245
RECOMMENDATION		Hall's Bootstrap UCL	111.8145
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	110.4095
		BCA Bootstrap UCL	114.0619
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	163.6173
		97.5% Chebyshev (Mean, Sd) UCL	201.5624
		99% Chebyshev (Mean, Sd) UCL	276.0981

Table C-10a
Penryn Property

Site Hazard/Risk Evaluation
Following Recommended Cleanup Goal of 16 mg/kg**

Constituent of Concern	EPC*	Air (Non-Voc) Concentration(C_a) (mg/m^3)	ABS	Oral + Dermal				Inhalation			
				RfD_o	CSF_o	Soil		RfD_i	CSF_i	Air-Non-VOC	
				(mg/kg-d)	$(mg/kg-d)^{-1}$	HQ	Risk	(mg/kg-d)	$(mg/kg-d)^{-1}$	HQ	Risk
Arsenic	7.6	3.80E-07	0.03	3.00E-04	9.5E+00	4.2E-01	1.5E-04	3.0E-04	1.2E+01	8.09E-04	6.79E-07
DDE	0.5	2.50E-08	0.05	5.00E-04	3.4E-01	1.9E-02	4.3E-07	5.0E-04	3.4E-01	3.20E-05	1.27E-09
DDT	0.5	2.50E-08	0.05	5.00E-04	3.4E-01	1.9E-02	4.3E-07	5.0E-04	3.4E-01	3.20E-05	1.27E-09
Methoxychlor	0.13	6.50E-09	0.05	5.00E-03	0.00E+00	5.0E-04	0.0E+00	5.0E-03	0.00E+00	8.31E-07	0.00E+00
Endrin	0.17	8.50E-09	0.05	3.00E-04	0.00E+00	1.1E-02	0.00E+00	3.00E-04	0.00E+00	1.81E-05	0.00E+00
					Sub-Total	4.6E-01	1.5E-04			8.7E-04	6.8E-07

	Hazard Index	Incremental Lifetime Cancer Risk
Total	4.6E-01	1.5E-04

Notes:

* Exposure Point Concentration = 95% UCL following hypothetical 16 mg/kg cleanup

**See Table 13 containing supporting statistical analysis

Soil Hazard Equations

$Hazard_{soil}$ = ((Cs/RfDo) x (1.28 x 10-5)) + ((Cs/RfDo) x (1.28 x 10-4)) x ABS

$Hazard_{air}$ = (Cs/Rfdi) x 0.639

Soil Risk Equations

$Risk_{soil}$ = (Sfo x Cs x (1.57 x 10-6)) + (Sfo x Cs x (1.87 x 10-5) x ABS)

$Risk_{air}$ = Sfi x Cs x 0.149

Where:

Sf_o = oral cancer slope factor (mg/kg-day)-1

Sf_i = inhalation cancer slope factor (mg/kg-day)-1

C_s = concentration in soil, mg/kg

C_a = concentration in air, mg/kg

RfD_o = oral reference dose, in units of mg/kg-day

RfD_i = inhalation reference dose, in units of mg/kg-day

ABS = absorption fraction (dimensionless)

Table C-10b
Penryn Property

Supporting Statistics
for Table C-10a

Data File	As Cleanup goal of 16 mg/kg	Variable:	Arsenic

Raw Statistics	
Number of Valid Samples	165*
Number of Unique Samples	58
Minimum	0.25
Maximum	16
Mean	6.304545
Median	8
Standard Deviation	3.912643
Variance	15.30877
Coefficient of Variation	0.620607
Skewness	0.461585

Gamma Statistics	
k hat	2.024257
k star (bias corrected)	1.991492
Theta hat	3.114499
Theta star	3.165739
nu hat	668.0047
nu star	657.1925
Approx.Chi Square Value (.05)	598.7055
Adjusted Level of Significance	0.048545
Adjusted Chi Square Value	598.2194

Log-transformed Statistics	
Minimum of log data	-1.386294
Maximum of log data	2.772589
Mean of log data	1.574379
Standard Deviation of log data	0.825225
Variance of log data	0.680996

RECOMMENDATION
Data are Non-parametric (0.05)
Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.182763
Lilliefors 5% Critical Value	0.068975
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	6.808412

Gamma Distribution Test	
A-D Test Statistic	6.610598
A-D 5% Critical Value	0.765777
K-S Test Statistic	0.235769
K-S 5% Critical Value	0.073625
Data do not follow gamma distribution	
at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	6.92043
Adjusted Gamma UCL	6.926054

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.245888
Lilliefors 5% Critical Value	0.068975
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	7.728677
95% Chebyshev (MVUE) UCL	8.942685
97.5% Chebyshev (MVUE) UCL	9.883903
99% Chebyshev (MVUE) UCL	11.73274

95% Non-parametric UCLs	
CLT UCL	6.805566
Adj-CLT UCL (Adjusted for skewness)	6.817261
Mod-t UCL (Adjusted for skewness)	6.810236
Jackknife UCL	6.808412
Standard Bootstrap UCL	6.811789
Bootstrap-t UCL	6.834931
Hall's Bootstrap UCL	6.83502
Percentile Bootstrap UCL	6.82303
BCA Bootstrap UCL	6.817879
95% Chebyshev (Mean, Sd) UCL	7.632261
97.5% Chebyshev (Mean, Sd) UCL	8.206765
99% Chebyshev (Mean, Sd) UCL	9.335266

*Based on over 16 mg/kg with hypothetical confirmation sample value of 8 mg/kg

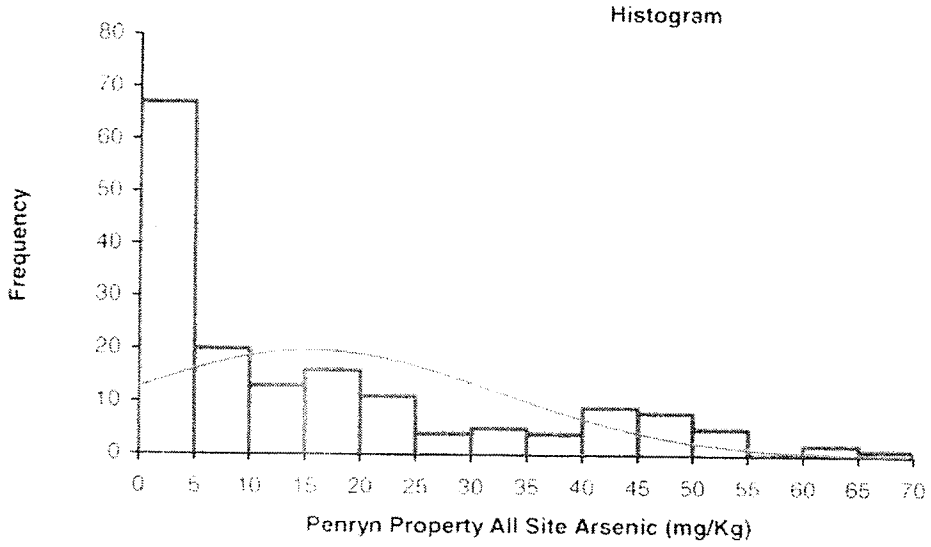
EXHIBITS

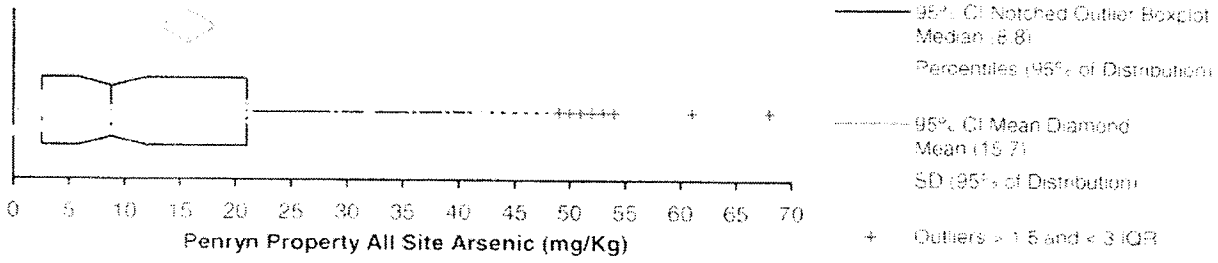
Test: Non-Transformed Data

Penryn Property Site Arsenic

Performed by: Bill Flores

Date: 2 January 2008





n	165
Mean	15.662
95% CI	13.102 to 18.222
SE	1.2964
Variance	277.302
SD	16.652
95% CI	15.029 to 18.673
CV	106.3%
Skewness	1.18
Kurtosis	0.29
Shapiro-Wilk W	0.82
p	<0.0001

Median	8.800
95.7% CI	5.900 to 12.000
Range	67.75
IQR	18.500

Percentile	
0th	0.250 (minimum)
2.5th	0.957
25th	2.500 (1st quartile)
50th	8.800 (median)
75th	21.000 (3rd quartile)
97.5th	53.533
100th	68.000 (maximum)

Exhibit C-1

Analyse-it

Test: Non-Transformed Data

Performed by: Bill Flores

Date: 2 January 2008

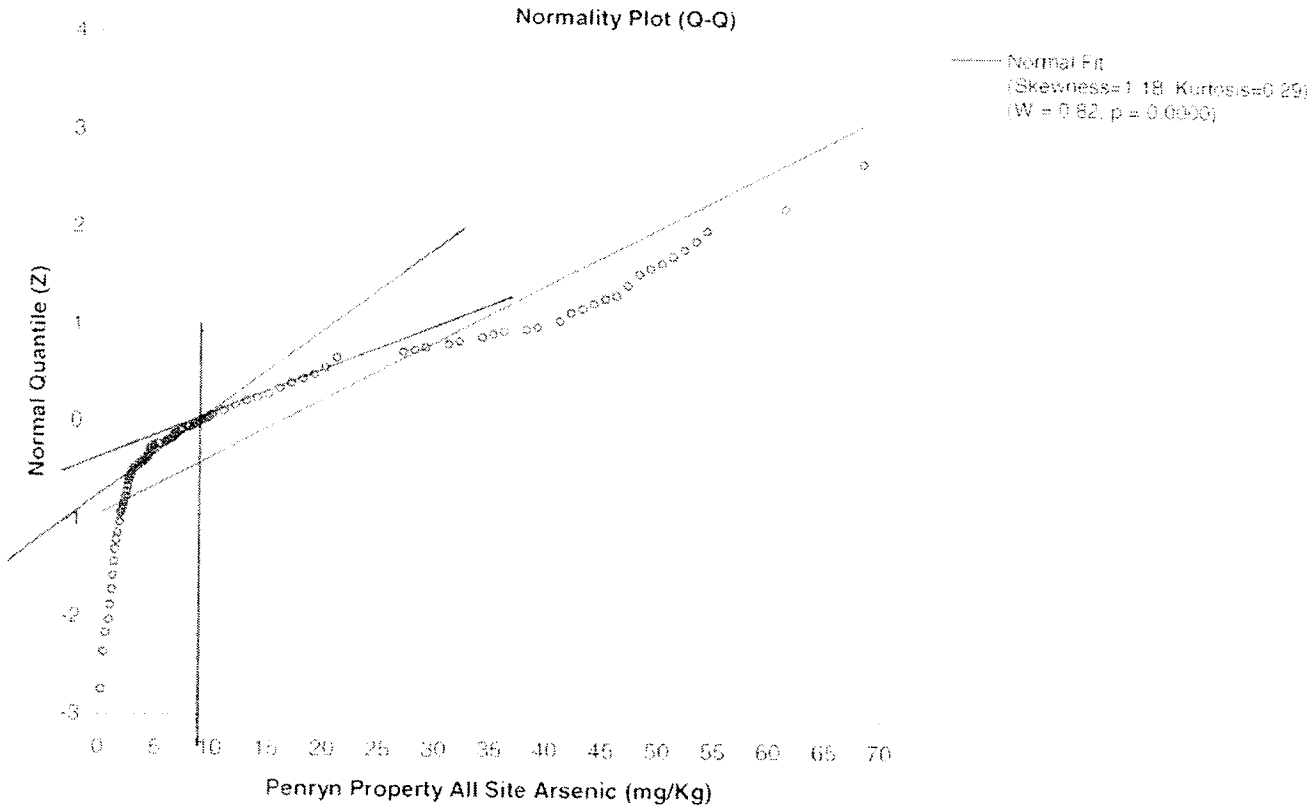
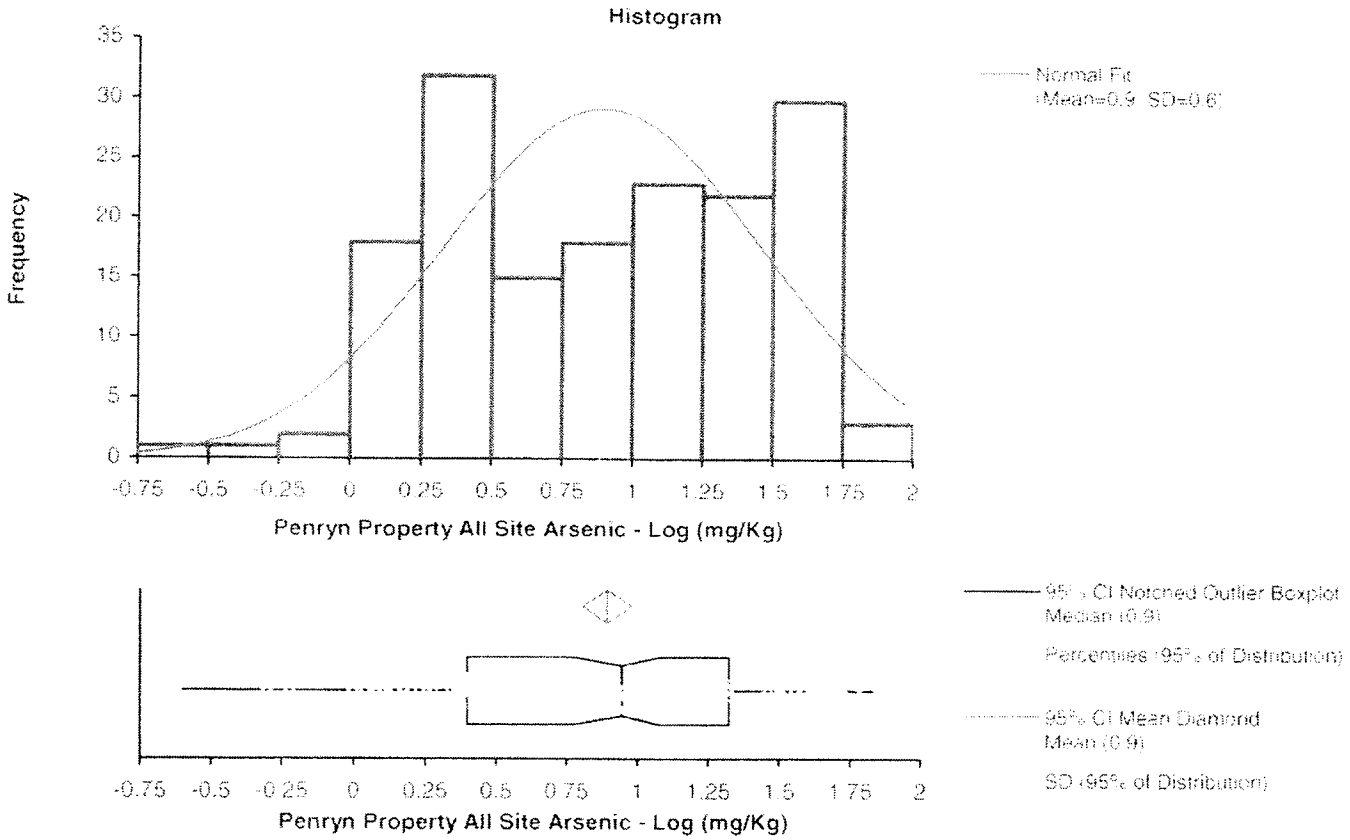


Exhibit C-1

Test: Lognormal Transformed Data

Performed by: Penryn Property All Site Arsenic
Bill Flores

Date: 7 January 2008



n	165
Mean	0.8937
95% CI	0.8074 0.9801
SE	0.0437
Variance	0.3158
SD	0.5620
95% CI	0.5072 0.6301
CV	62.9%
Skewness	-0.15
Kurtosis	-1.05
Shapiro-Wilk W	0.95
p	<0.0001

Median	0.9445
95.7% CI	0.7709 1.0792
Range	2.4346
IQR	0.9243

Percentile	
0th	-0.602
2.5th	-0.019
25th	0.398
50th	0.944
75th	1.322
97.5th	1.729
100th	1.833

Exhibit C-2

Test: Lognormal Transformed Data

Penryn Property All Site Arsenic

Performed by: Bill Flores

Date: 7 January 2008

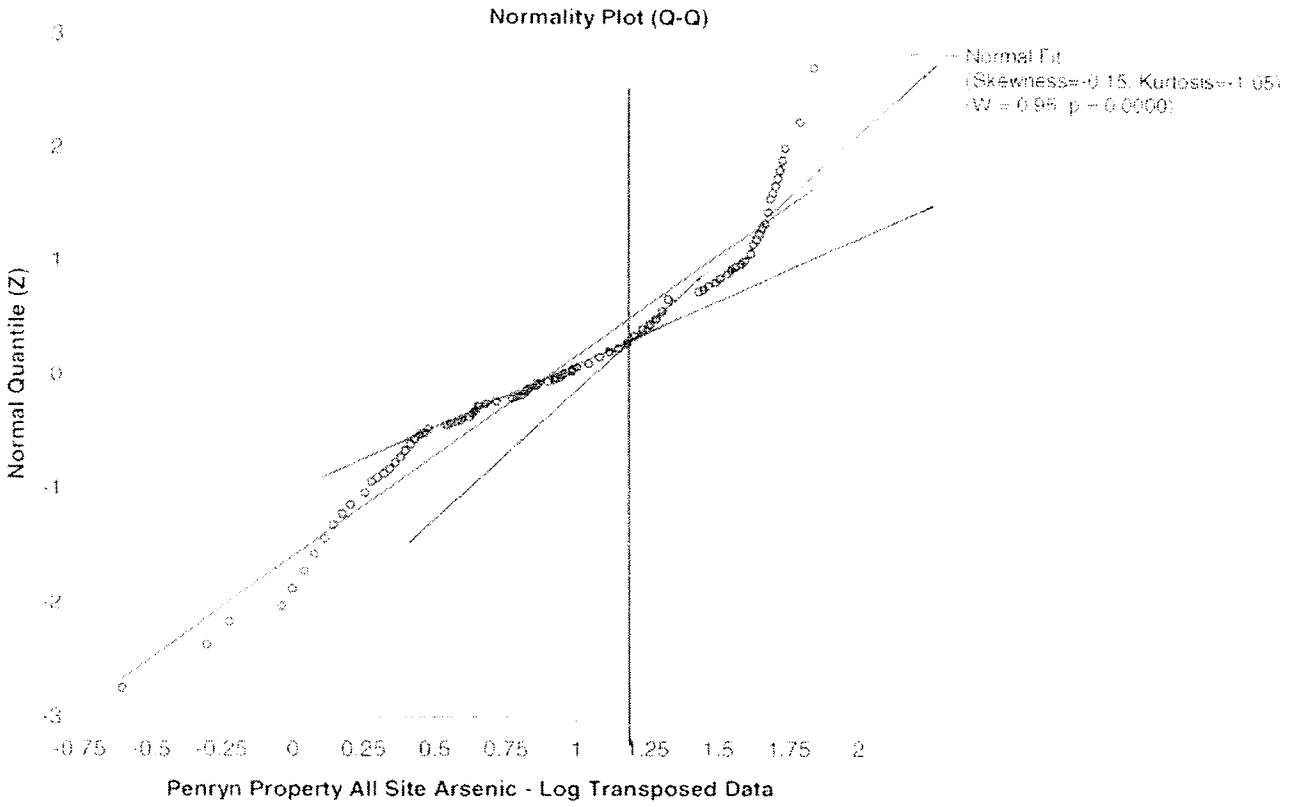


Exhibit C-2

APPENDIX D

HEALTH & SAFETY PLAN

HEALTH AND SAFETY PLAN

REMOVAL ACTION WORKPLAN

Draft Removal Action Workplan

PENRYN PROPERTY

Penryn, California

Prepared for:

Penryn Development, LLC
3990 Ruffin Road, Suite 100
San Diego, California 92123

Prepared By:

Wallace-Kuhl & Associates, Inc.
3251 Beacon Boulevard, Suite 300
West Sacramento, California 95691

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1.0 INTRODUCTION

Wallace-Kuhl & Associates (WKA) has prepared this Health and Safety Plan (HASP) on behalf of Penryn Development, LLC for the approximate 15-acre Penryn Property located approximately one and one-half miles northeast of the central business district of the incorporated town of Loomis, California. This HASP establishes the policies and procedures for the performance of the soil excavation work that protect the workers and the general public from potential health and safety hazards posed by the site action, including minimizing exposure to soil containing elevated concentrations of arsenic. All soil excavation activities will be conducted in a manner that minimizes the probability of injury, illness, property damage, or damage to the environment and will be performed in accordance with the Contractor's Injury and Illness Prevention Program (IIPP). This HASP has been prepared in accordance with and in reference to the following regulations, guidelines, and documents:

- United States Department of Labor, OSHA standards, specifically:
  - Title 29 CFR Part 1910.120 - Hazardous Waste Site Operations and Emergency Response
  - Title 29 CFR Part 1926 - Health and Safety Regulations for Construction

- California Occupational Health and Safety Regulations, specifically:
  - Title 8 CCR §5192 - Hazardous Waste Operations and Emergency Response
  - Title 8 CCR §5094 - Hazard Communication
  - Title 8 CCR §5095-5100 - Hearing Conservation
  - Title 8 CCR Chapter 4, Subchapter 4 - Construction Safety Orders
  - Title 8 CCR §3203 - Injury and Illness Prevention Program
  - Title 8 CCR §1532.1 - Inorganic Lead

- United States Environmental Protection Agency's Standard Operating Safety Guides, July 1988.

- NIOSH/OSHA/USCG/EPA Occupational Health and Safety Guidance Manual for Hazardous Waste Activities, October 1985.

Because Project conditions are subject to change and unforeseen conditions may arise, amendments or additions to this HASP may be needed during the course of work. Only the Contractor, with the assistance of a Certified Industrial Hygienist or Environmental Consultant, may modify the HASP.

This Plan will be made available to any contractor or subcontractor or their representative who will be involved with the work operation. It will also be made available to employees, to employee designated representatives, to Division of Occupational Safety and Health (DOSH)

representatives, and to personnel of other federal, state, or local agencies with regulatory authority over the Project.

1.1 Description of the Project

The site was formerly operated as a commercial orchard. Soil samples collected from the site indicate the presence, within definable site areas, of elevated concentrations of arsenic above acceptable human health screening levels, and several (marginal) occurrences of lead and organic pesticide compounds slightly exceeding human health screening levels.

Arsenic was identified as the primary chemical of concern for the Project in the Removal Action Workplan (RAW). Soil containing this compound will be removed during the Project to reduce residual concentrations of the chemical of concern below remedial goals established in the RAW.

1.2 Summary of Job Hazard Analysis

The primary chemical hazard for the Project includes potential hazard from exposure through inhalation of airborne particulates, by direct dermal contact, and/or ingestion of soil that may contain arsenic or secondary contaminants.

1.2.1 Inhalation Exposure

Environmental investigations were conducted to evaluate the concentrations of arsenic in the Project work areas. Laboratory analysis of soil samples from the site has yielded concentrations of arsenic ranging from less than a method detection level of 0.5 milligrams per kilogram (mg/kg) up to a detected level of 68 mg/kg.

Again, arsenic is the most significant contaminant of concern for worker and community exposures. Arsenic has an Occupational Safety and Health Administration (OSHA) 8-hour time-weighted-average (8-hour TWA) permissible exposure limit (PEL) of 0.01 milligrams per cubic meter (mg/m^3) and a National Institute of Occupational Safety and Health (NIOSH) 15-minute ceiling limit of 0.002 mg/m^3.

A fenceline dust action level was calculated by taking the permissible quantity of contaminant in mg/m^3 (arsenic at 0.01 mg/m^3), multiplying by the conversion factor of 1,000,000 milligrams per kilogram (mg/kg), and dividing by the maximum arsenic concentration in mg/kg (68 mg/kg). The resulting permissible arsenic dust concentration was calculated as 147 mg/ m^3.

Since the action level for visible dust is 5 mg/m^3. The dust action level for visible dust would be exceeded far before the dust action level for arsenic is exceeded, therefore no special metals monitoring should be required. Site action will cease upon the detection of visible dust.

Site monitoring efforts will be conducted in order to verify and document that exposure levels remain insignificant. Health hazards associated with the chemicals of concern are summarized in Appendix D-A. Workers will be notified about the risks of arsenic as described in the following sections.

1.2.2 Dermal Contact and Ingestion

Concentrations of arsenic were compared to United States Environmental Protection Agency (USEPA) Region 9 preliminary remedial goals (PRGs) for industrial setting. Actions will be taken to reduce dermal contact and ingestion as described below.

1.3 Hazard Assessment

1.3.1 Chemical Hazards

The chemicals of concern for this project include arsenic, lead, and organic pesticide compounds. Information on the health effects of arsenic is included here based on the historical use of the work area.

United States Occupational Safety and Health Administration Permissible Exposure Limits (OSHA PELs) and the National Institute of Occupational Safety and Health Recommended Exposure Limits (NIOSH RELs) are summarized below. Chemical hazard information is summarized in Appendix A. The summaries are excerpted from reports by the Centers for Disease Control (CDC, 2003) and the Agency for Toxic Substances Disease Registry (ATSDR, 2003).

1.3.1.1 Arsenic

The OSHA 8-hour TWA PEL for arsenic is 0.010 mg/m^3. The NIOSH 15-minute Recommended Exposure Level (REL) is 0.002 mg/m^3.

1.3.1.2 Lead

The OSHA PEL for lead is 0.050 mg/m^3. NIOSH states that air concentrations should be maintained so that worker blood lead remains less than 0.060 mg Pb/100 g of whole blood.

1.3.1.3 Organochlorine Pesticides

The OSHA 8-hour TWA PEL for DDT, DDE and DDD is 1.0 mg/m^3. The NIOSH 15-minute REL is 0.5 mg/m^3. The OSHA 8-hour TWA PEL for Endrin is 0.1 mg/m^3

1.3.2 Dermal Exposure

Incidental dermal exposure to soil containing chemicals of concern is a secondary exposure route of concern. This exposure pathway will be controlled with the institution of proper hygienic

practices (Section 2.4 and Section 9.0) and use of appropriate personal protective equipment (Section 7.0).

1.3.3 Ingestion Exposure

Incidental ingestion of soil containing chemicals of concern is a secondary exposure route of concern. This exposure pathway will be controlled with the institution of proper hygienic practices (Section 2.4 and Section 9.0).

1.3.4 Physical Hazards

The construction activity at the Project will utilize heavy equipment for excavation, loading and transport of soil. Scrapers and dump trucks will be used to transport material on site. Excavation equipment may include graders, front-end loaders and/or an excavator loading directly into end-dump trucks. Physical hazards associated with these activities include slips, trips, and falls, heavy equipment and truck operations, vehicular traffic, noise, and weather and heat stress. Physical hazards will be reduced by adherence to the Contractors IIPP and Code of Safe Work Practices.

1.3.4.1 Heat Stress

Heat stress may become an issue depending on the time of year this action is implemented. Ambient site temperatures can range in excess of 100 degrees Fahrenheit. Heat stress can occur within as little as 15 minutes, and can pose as great a danger to worker health as chemical exposure. In its early stages, heat stress can cause rashes, cramps, discomfort and drowsiness, resulting in impaired functional ability that threatens the safety of both the individual and workers. Continued heat stress can lead to heat stoke and death.

1.3.4.2 Fire Prevention

High temperatures and dry vegetation in the work area may lead to high risk for grass fires. To aid in fire suppression, all mowing of vegetation will take place in the morning hours when temperatures are cool. In addition, vehicles will be equipped with fire extinguishers. A water truck will be available onsite during activities presenting a potential fire hazard.

1.4 Confined Space Entry

It is not anticipated that the work activities will include confined space entry. If confined space entry operations are to be performed as a part of the Project, the Contractor should refer to its IIPP.

1.5 Site Excavations

Site excavations created during initial site preparation or during material excavation will be shored or sloped as appropriate to prevent accidental collapse in accordance with 8 CCR, Chapter 4, Subchapter 4, Article 6.

1.6 Pathways for Hazardous Substance Dispersion

Hazardous substances may have been and could possibly be dispersed from the source by air. Further dispersion by air will be controlled using dust control measures.

1.7 Health and Safety Plan

This Plan will be made available to any contractor or subcontractor or their representative who will be involved with the work operation. It will also be made available to employees, to employee designated representatives, to DOSH representatives, and to personnel of other federal, state, or local agencies with regulatory authority over the Project.

1.8 Team Composition

The organizational structure part of this plan establishes the specific chain of command and specifies the overall responsibilities of supervisors and employees. The organizational structure will be reviewed and updated as necessary to reflect the status of Project operations. The key project personnel are shown below. Resumes of key site personnel are included in Appendix C.

Key Project Personnel		
Project Superintendent	Matthew Taylor Wallace-Kuhl & Associates, Inc.	Office: (916) 372-1434 Mobile: (916) 997-7099
Excavation Competent Person	To Be Determined	Office: Mobile:
Site Health and Safety Officer (SSO)	Bryce Thomas Wallace-Kuhl & Associates, Inc.	Office: (916) 290-5429 Mobile: (916) 997-0770
Project Manager	William M. Flores Wallace-Kuhl & Associates, Inc.	Office: (916) 435-9722 Mobile: (916) 997-0844
Corporate Health & Safety Officer	Andy Wallace Wallace-Kuhl & Associates, Inc.	Office: (916) 372-1434 Mobile: (916) 997-7099

1.8.1 Description of Responsibilities

1.8.1.1 Project Superintendent

The Project Superintendent is responsible for safety and health on the job site, and reports to upper level management, including the Corporate Health and Safety Officer. He is expected to:

- Manage field operations
- Use the SSO to help implement the safety and health requirements
- Remain informed about company safety and health policies and programs affecting the job site
- Provide job-specific safety and health training to employees under his supervision
- Ensure that each employee is able to safely complete each task to which he is assigned and that equipment and machinery are maintained in safe operating condition
- Conduct inspections at the job site to identify hazardous conditions and work practices
- Investigate and report accidents and near-accidents, and implement corrective actions
- Report to the Project Manager any known or potentially unsafe or unhealthful condition, including those identified by employees under their supervision, which they cannot immediately correct or for which they require assistance in correcting.

1.8.1.2 Excavation Competent Person

An Excavation Competent Person is defined in 8 CCR 1504(a) as one who is capable of identifying existing and predictable hazards that is unsanitary or dangerous to employees. The competent person has authority to impose prompt corrective measures to eliminate these hazards. The Excavation Competent Person has the authority to shut down operations until corrective actions are implemented.

1.8.1.3 Site Health and Safety Officer

The Site Health and Safety Officer (SSO) advises the Project Superintendent on all aspects of health and safety at the Site, and can stop work if any operation threatens worker or public health or safety. He is expected to:

- Select and periodically inspect protective clothing and equipment condition, use, storage and maintenance.
- Control entry and exit from the Site.
- Coordinate health and safety activities with the Project Superintendent.
- Confirm each team member's suitability for work based on a physician's recommendation.
- Monitor work parties for signs of heat stress and fatigue.
- Monitor onsite hazards and conditions.
- Implement the Health and Safety Plan.
- Conduct periodic inspections to determine if the HASP is being followed.
- Enforce the "buddy system."
- Understand emergency procedures.

- Notify, when necessary, local public emergency officials, and
- Coordinate emergency medical care.

1.8.1.4 Project Manager

The Project Manager is responsible for the on time, on budget completion of the project. He is the main contact with the Owner or responsible party. He is responsible for budgeting and providing the necessary safety facilities, equipment and money.

1.8.1.5 Corporate Health and Safety Officer

The Corporate Health and Safety Officer is responsible for overall company compliance with the IIPP and the Code of Safe Practices. He is responsible for ensuring the overall implementation of the IIPP by directing and coordinating the following tasks:

- Identification and evaluation of workplace hazards, including regular inspections to identify unsafe conditions and work practices.
- Development of methods and procedures for correcting and controlling unsafe and unhealthy conditions, work practices and procedures.
- Employee training and instruction in both general and job-specific safety and health hazards and controls, and as required by other safety and health programs.
- Communication with employees in an understandable manner regarding matters relating to occupational safety and health.
- Ensuring employee compliance with safety and health rules, practices and procedures.
- Investigation of occupational injuries and illnesses, identification of causative factors and implementation of hazard control actions.
- Development and implementation of safety and health programs related to the IIPP.
- Maintenance of records for the implementation of the IIPP and related safety and health programs.

1.8.1.6 Contractor's Environmental Consultant

The Environmental Consultant is the primary author of the HASP. He has overall responsibility for developing sampling plans, conducting the sampling and requesting laboratory analysis associated with project Health and Safety. He advises the Project Manager, the Project Superintendent and the SSO on technical issues regarding air monitoring and the HASP.

1.8.1.7 Owner's Environmental Consultant

The Owner's/responsible party's Environmental Consultant has overall responsibility for confirmation sampling of the soil. The Owner's/responsible party's Environmental Consultant is

responsible for ensuring that the requirements of the HASP are implemented during confirmation sampling. For Health and Safety issues, he reports to the Project Superintendent.

2.0 COMPREHENSIVE WORK PLAN

2.1 Objectives

This Work Plan outlines the activities that will take place during the excavation of soil. It is noted that variations in the extent and degree of concentrations may occur during the implementation of the project. Workers shall notify the Site Superintendent or SSO immediately of any variation uncovered during the work. It is acknowledged that the Contractor will notify the Owner immediately of any variation uncovered by the work as soon as any such variation becomes known.

2.2 EXPECTED PROJECT ACTIVITIES

The work activities involving soil contaminated with hazardous substances will consist of the following:

- Establishing site work zones,
- Performing excavation, and
- Loading of materials for off-site disposal.

2.3 WORK PLAN PROCEDURES

2.3.1 Safety Meetings

Prior to the beginning of work activities at the site, a safety meeting will be conducted. This initial site safety meeting will address the hazards of the Project and provisions for reducing the hazards as presented in this plan. The meeting will also be used for planning the various stages of the work and to disseminate relevant information contained in this plan to subcontractors working in the vicinity of the work discussed herein. The first tailgate meeting will also present the lead awareness training.

Tailgate safety meetings will occur weekly and will be recorded on a tailgate safety meeting form. Topics will include but will not be limited to the following:

- The previous week's work activities
- Safety concerns brought about by these activities
- Anticipated stages of work for the week
- Changes in scope or original work

- Introduction and orientation of new employees (if any)
- Review of previous week's sampling or analytical results
- Lines of communication
- Evacuation routes
- Changes in protection levels

2.3.2 Perimeter Establishment

Based on the site hazard assessment, there appears to be limited potential for zones of work where the worker activities involve exposure to chemicals of concern above established worker protection standards. Based on the results of air monitoring conducted at the start of the Project, an exclusion zone may be established by the Site Health and Safety Officer pursuant to 29 CFR 1910.120 and 8 CCR 5192.

Access to active work areas will be restricted to the extent practicable in a manner consistent with Site work zones. Unauthorized entry to the Exclusion Zone will not be permitted without acknowledgement of this plan and the required training and personal protective equipment described herein.

The perimeter boundaries will be firmly established at the first tailgate safety meeting. Exposure for the public will also be limited by preventing contact between the public and work areas using fencing and signs. Pedestrian traffic is expected to be minimal but will be prevented from coming into contact with equipment or contaminants from the site.

2.3.3 Work Procedures

Surface vegetation will be cleared. Soil will be removed using scrapers or excavators, and will be transported to the disposal cells either in scrapers or end-dump trucks. All work will be conducted to minimize visible dust. The work will be monitored for visible dust as described in section 8.1, and dust suppression methods described below will be implemented to control visible dust.

If unidentified contamination is observed, work will be stopped and the Project Superintendent, SSO and Environmental Consultant notified. Work will not resume in the affected area until the contaminant is identified, and safe work procedures established.

All excavation will occur according to the procedures outlined in the safe practices listed below. The contractor has acquired an annual trenching permit as required by the California Division of Occupational Safety & Health for work in excavations. The California Division of Occupational Safety & Health will also be notified of all trenching activities that require notification. While

not anticipated, excavations requiring shoring will be designed and approved by a Registered Civil Engineer prior to entry by site personnel.
All personnel who may be required to enter an excavation must have received training in excavation safety procedures prior to entry. An excavation Competent Person will be present at the site whenever employees enter excavations requiring such a person.

2.3.4 Excavating/Stockpiling Soil

Soil will either be removed with a scraper or excavated and direct-loaded into trucks for hauling to the disposal cell. The soil will be wetted as necessary prior to handling to suppress visible dust.

2.3.5 Dust Control

The Placer County Air Pollution Control District (PCAPCD) has rules potentially germane to this project's *Health and Safety Plan* including:

- Rule 202 (Visible Emission);
- Rule 205 (Nuisance); and
- Rule 207 (Particulate Matter Concentration).

To comply with these rules the following dust control and administrative requirements will be employed at the site:

Dust control will be achieved by applying water before and during earthwork and on traffic areas using a water truck equipped with a jet sprayer. In other words, prior to starting excavation activities, the impacted soil will be wetted daily to minimize dust.

Soil stabilization will be performed where disturbed land is left unattended after normal working hours and on weekends and holidays. A water truck will be used to form a visible crust on the soil. Furthermore, vehicles will be restricted from accessing the stabilized area.

On-Site Unpaved Traffic Areas

Effective dust control measures will be employed to minimize VDE caused by vehicle/heavy equipment traffic on-site unpaved roads, parking lots, and staging areas. A list of effective dust control measures to be employed at the site on a daily basis is as follows:

- A maximum vehicle speed limit of fifteen (15) miles per hour or less

- Construction workers and visitors will park in designated parking area (s) to help reduce VDE
- Watering every two hours of active operations or sufficiently often to keep the area adequately wetted
- Spraying down the unpaved traffic areas at the end of the work shift to form a thin crust. This application of water will be in addition to the minimum rate of application (at least 4 times per day)
- Any other measure as effective as the measures listed above

Track-out Prevention and Control

Track-out and carryout are materials adhered to vehicle tires and transport vehicles carried from a construction site and deposited onto a paved public road. A list of effective track-out prevention and dust control measures in the order of preference to be implemented at the site are as follows:

Option 1

- Immediately removing any visible track-out from a paved public road at any location where vehicles exit the site; this shall be accomplished by manually wet-sweeping or wetting the area prior to mechanically sweeping using a PM10-efficient street sweeper to limit VDE. This procedure will be performed immediately upon observing track-out and/or at the end of the workday or at least one time per day unless conditions warrant a greater frequency. This is the most feasible option for providing the track-out prevention and dust control measures at the site giving the work location and site activities; and

Option 2

- Installation of one or more of the following track-out prevention measures:
  1. A gravel pad designed using good engineering practices to clean the tires of exiting vehicles
  2. A tire shaker
  3. A wheel wash or spray system; or
  4. Any other measure as effective as the measures listed above. This option will be employed in the event that option 1 is deemed inadequate.

A water truck or on-site water supply will be available throughout the excavation, loading and transportation of soil. The water truck will be used to apply water through a spray that wets the

soil. The water will be applied in sufficient quantity and at a frequency such that water is absorbed by soil, but does not result in run-off of excess water. If it is necessary to create stockpiles, they will be inspected regularly and water applied on a frequency adequate to prevent generation of airborne dust. The frequency will be adjusted based on visual observations of stockpile conditions. Trucks transporting soil will be covered with tarps prior to leaving the Site. Other dust control techniques may include reduced vehicular speeds onsite, minimizing drop heights wile loading and unloading soil, and suspending earthmoving operations or other dust-producing activities during periods of high winds.

2.3.6 Site Cleanup

Site cleanup will be accomplished, when necessary, by means that will eliminate exposure to dust and other potentially harmful substances. Material will be removed from the exteriors of transportation vehicles using brooms prior to the vehicle exiting the loading area. Material removed from the exteriors of vehicles will be placed either into the vehicle for transport or back into the stockpile from which it came. Trucks will only be loaded next to the excavation or stockpile area to prevent from being deposited onto public roadways.

2.4 SAFE WORK PRACTICES FOR WORKING WITH CONTAMINATED SOIL

The following work practices will be adopted for work at this site that involves handling, moving, transporting, testing, or coming into contact with soil containing elevated levels of chemicals of concern:

- Keep airborne dust to an absolute minimum using water
- Prevent soil ingestion by not eating, smoking, drinking and chewing tobacco or gum near work operations
- Avoid runoff of dust suppression water
- Wash hands and face before eating, drinking, smoking, or using bathroom. This requires an adequate supply of wash water, soap, and towels on site. Store food and water so it will not be contaminated, and
- Read, review and sign the Health and Safety Work Plan.

All material handling, transportation and placement operations will be conducted to minimize visible dust. The material will either be placed directly into a truck for off-site disposal or in a stockpile until it can be reused on-site.

All excavation will occur according to the procedures outlined in the safe practices listed above. The contractor has acquired an annual trenching permit as required by the DOSH for work in excavations. The DOSH will also be notified of all trenching activities that require notification.

While not anticipated, excavations requiring shoring will be designed and approved by a Registered Civil Engineer prior to entry by site personnel.

All personnel who may be required to enter an excavation must have received training in excavation safety procedures prior to entry. An excavation Competent Person will be present at the site whenever employees enter excavations requiring such a person.

3.0 PERSONNEL TRAINING REQUIREMENTS

A health and safety training program will be provided for the following groups of employees working at the Site: laborers working on the ground in the Site, heavy equipment operators and truckers who will leave their cabs within the Site, personnel involved in sampling and construction observation within the Site, and supervisory personnel for workers in the Site. If work zones as defined in Section 6.0 are implemented due to air monitoring results in excess of action levels, then all employees working within the exclusion zone must be covered by the health and safety training program.

In addition, information concerning lead hazards will be communicated to all employees according to the requirements of OSHA's Hazard Communication Standard for the construction industry, Title 29 CFR 1926.59 and Title 8 CCR 5192 including signs and labels, material safety data sheets (MSDS), and employee information and training. The health and safety training will be provided at the first tailgate safety meeting.

In addition, the following requirements will be followed:

- A training program in accordance with this section will be provided for all employees who are subject to exposure to lead or other chemicals of concern at or above the action levels on any day
- The training program will be provided to all affected employees prior to the time of job assignment; and
- The training will be provided at least annually for each affected employee.

Each employee requiring training will be trained in the following:

- The required 40-hour training for hazardous waste site workers as outlined in 29 CFR 1910.120(e), and the required refresher training
- The content of Title 8 CCR 5192 and Title 8 CCR 1532.1 and its appendices

- The specific nature of the operations which could result in exposure above the action levels
- The purpose, proper selection, fitting, use, and limitations of respirators
- Their purpose and a description of the medical surveillance program, and the medical removal protection program including information concerning the adverse health effects associated with excessive exposure to contaminants (with particular attention to the adverse reproductive effects on both males and females and hazards to the fetus and additional precautions for employees who are pregnant)
- The engineering controls and work practices associated with the employee's job assignment including training of employees to follow relevant good work practices described in Appendix B of Title 8 CCR 1532.1
- The employee's right of access to records under Title 29 CFR 1910.20.

4.0 MEDICAL SURVEILLANCE PROGRAM

While not required initially, a medical surveillance program may be required if hazardous substances are encountered at the site. A medical surveillance program will be instituted for the following employees:

- Any employee who is or may be exposed to hazardous substances or health hazards at or above the PELs or, if there is no PEL above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year
- Any employee who wears a respirator during any part of a day for a period of 30 days or more in a year, or as required by 8 CCR 5144
- Employees exhibiting symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.

4.1 FREQUENCY OF MEDICAL EXAMINATIONS AND CONSULTATIONS

The employer will also make medical examinations and consultations available to each employee covered under Section 5.0 on the following schedules:

- Prior to assignment
- At least once every twelve months for each employee covered, unless the attending physician believes a longer interval (not greater than biennially) is appropriate
- At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last six months

- As soon as possible, upon notification by an employee either that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards or that the employee has been injured or exposed above the PELs or published exposure levels in an emergency situation
- At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary
- For employees who may have been injured, received a health impairment, developed signs or symptoms which may have resulted from exposure to hazardous substances resulting from an emergency incident, or who have been exposed during an emergency incident to hazardous substances at concentrations above the PELs or the published exposure levels without the necessary personal protective equipment being used will undergo a medical examination
- As soon as possible following the emergency incident or development of signs or symptoms
- At additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary.

4.2 CONTENT OF MEDICAL EXAMINATIONS OR CONSULTATIONS

If necessary, the content of initial medical examinations will contain, at a minimum, the following:

- Complete medical and occupational history,
- General physical examination including an evaluation of all major organ systems

4.3 EXAMINATION BY A PHYSICIAN

All medical examinations and procedures will be performed by or under the supervision of a licensed physician certified in occupational medicine by the American Board of Preventative Medicine.

4.4 INFORMATION PROVIDED TO THE PHYSICIAN

The employer will provide one copy of this standard and its appendices to the attending physician, and in addition, the following for each employee:

- A description of each employee's duties as they relate to the employee's exposures,
- Each employee's exposure levels or anticipated exposure levels
- A description of any Personnel Protective Equipment (PPE) used or to be used by each employee

- Information from previous medical examinations of each employee which is not readily available to the examining physician, and
- Information required by Title 8 CCR 5144 for each employee.

4.5 PHYSICIAN'S WRITTEN OPINION

The written opinion obtained by the employer will not reveal specific findings or diagnoses unrelated to occupational exposures. The physician will provide the results of the medical examination and tests to the employee if requested. The employer will obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following:

- The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use
- The physician's recommended limitations upon the employee's assigned work
- A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions, which require further examination or treatment.

4.6 MEDICAL SURVEILLANCE RECORD-KEEPING

An accurate record of the medical surveillance will be retained. This record will be retained for the period specified and meet the criteria of Title 8 CCR 3204. The record will include at least the following information:

- The name and social security number of the employee
- Physician's written opinions, recommended limitations, and results of examinations and tests
- Any employee medical complaints related to exposure to hazardous substances
- A copy of the information provided to the examining physician by the employer, with the exception of the standard and its appendices.

5.0 SITE SAFETY MEETINGS

Tailgate safety meetings will be held prior to the start of work and weekly thereafter. Topics to be discussed will include health and safety hazards associated with the day's activities and any safety-related issues from the previous week's work. The meetings will include a discussion of the employer's health and safety program and the means, methods, devices, processes, practices,

conditions, or operations, which the employer intends to use in providing a safe and healthy place of employment.

Visitors who find it necessary to enter the site must receive a short orientation covering the relevant safety information contained in this plan.

5.1 DOCUMENTATION OF SITE SAFETY MEETINGS

A detailed record of each safety meeting and health and safety conference will be made on the Safety Meeting Form. Visitor training will also be recorded on this form.

6.0 SITE CONTROL PROGRAM

Appropriate site control procedures will be implemented to control the exposure of employees and the public to hazardous substances, both before cleanup work begins and during excavation operations. The site control program may be modified as necessary as new information becomes available. At a minimum, the Site boundaries will be controlled by maintaining and controlling existing property fencing, gates and signs. The public will not be allowed to enter the property and in particular the Site. Unauthorized personnel will be escorted from the property during working hours.

6.1 NOTIFICATION

As required by the Remedial Design and Implementation Plan (Appendix A of the RAW - MWH, 2003), off-site residents will be informed of the general nature of mitigation work on the property when earthwork operations are occurring. Signs stating "Warning Construction Site, Authorized Personnel Only" and "No Trespassing" will be attached to the property fence at several locations.

6.2 SITE WORK ZONES

Based on the concentrations of arsenic reported for site soil, it is not anticipated that formal hazardous waste work zones will be required. Should total visible dust concentrations be found exceeding the dust action level of 5 mg/m^3 in a proposed excavation area, site work zones will be established as described below. To prevent migration of contamination caused by personnel or equipment, work areas and personal protective equipment will be clearly specified prior to beginning operations. Designated work areas or zones will be established and delineated, as suggested by the OSHA Guidance Manual for Hazardous Waste Site Activities. Each contaminated work area will be divided into three zones: an Exclusions Zone (EZ), a Contamination Reduction Zone (CRZ), and a Support Zone (SZ).

6.2.1 Exclusion Zone

The Exclusion Zone (EZ) will consist of areas where inhalation, oral contact or dermal contact with contaminants is considered possible. It is anticipated that the EZ boundary around each excavation will be clearly and conspicuously marked using cyclone fencing, boundary tape or safety fencing and signs. The signs will specify that only trained and authorized personnel that are allowed to enter. Authorization to enter can be obtained from the foreman/site supervisor. The entry and exit point will be established through the Contamination Reduction Zone (CRZ). Entry will be limited to essential personnel or pre-approved visitors.

6.2.2 Contamination Reduction Zone

The CRZ will be established between the EZ and Support Zone (SZ). In this area, personnel will begin the sequential decontamination process required to exit the EZ. To prevent offsite migration of contamination and to facilitate personnel accountability, all personnel will enter and exit the EZ through the CRZ.

All waste soil generated in the CRZ will be collected and added to trucks for transport to the disposal cell. Other waste materials including PPE will be labeled as such and properly disposed of according to their hazard classifications.

6.2.3 Support Zone

The SZ will consist of a clearly marked area where the office, break areas, and changing facilities are located. Smoking, drinking and eating will only be allowed in designated areas. Sanitation facilities (toilets, drinking and washing water) are provided in the SZ.

6.2.4 Access Controls During Site Operations

Physical boundaries will be established around each work zone using barricade tape during hazardous material removal operations. Supervisors will instruct all workers and visitors on the limits of the restricted areas. No one will be allowed to enter a restricted area without the required protective equipment for that area. The Site Health and Safety Officer will ensure compliance with all restricted entry and exit procedures. A decontamination point will be designated for personnel to exit from the contaminated area and enter into the clean area where they may rest and drink fluids. Visitors should check in immediately upon arrival. Only authorized visitors will be allowed access to the contaminated areas. Each visitor will be required to provide and wear the necessary protective equipment during visits and will be escorted by supervisory personnel while onsite. All visitors, subcontractors and other personnel will be required to sign a safety plan acknowledgement sheet to certify that they have read and

will comply with the Site Health & Safety Plan. Failure to comply with this site entry procedure will result in expulsion from the site.

6.3 BUDDY SYSTEM

The buddy system will be used at all times on the site. Employees will be organized into work groups in such a manner that each employee of the work group must be observed by at least one other employee in the work group. The purpose of the buddy system is to provide quick assistance to employees in the event of an emergency.

7.0 PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment (PPE) has been selected which will protect employees from the hazards and potential hazards they are likely to encounter as identified during the site characterization and analysis. The level of protection provided by PPE selection may be increased if additional information on site conditions shows that increased protection is necessary to reduce employee exposures below established PELs and published exposures levels for hazardous substances and health hazards. Safety vests, safety glasses, earplugs and steel-toed boots are required at the site at all times. Hardhats are required of all those working on the ground within reach of excavation equipment or other overhead hazards. Should any additional suspected or known material contamination be found during the course of work, a secure perimeter will be established around the impacted area until modifications can be made to the Health and Safety Plan.

7.1 PPE SELECTION AND ACTION LEVELS

Initial PPE requirements for the undesignated work areas at the Project will be modified EPA Level D as outlined below. The presence of dust will be visually monitored. Dust is generally visible at approximately 3 mg/m^3. The Action Level for visible dust is 5 mg/m^3. Therefore, if visual air monitoring indicates the presence of dust for more than 30 seconds, additional real-time air monitoring will be implemented, as discussed in Section 8.0, and additional engineering controls will be implemented to mitigate dust. If real-time air monitoring indicates airborne dust concentrations above the Action Level, and if engineering controls do not mitigate the airborne dust concentrations, then PPE will be upgraded to the Level C equipment presented in the table below. If a previously unidentified material is discovered during work operations, PPE will be modified as necessary and in consultation with the Environmental Consultant.

Modified Level D PPE Requirements

Location	Tasks	PPE Level	Equipment Required
Undesignated Active Work Areas	All tasks unless otherwise	D	• Hard Hat (workers on ground within reach of excavation equipment) • High-Visibility Safety Vests • Ear Plugs

	specified		• Leather work boots • Safety Glasses • Coveralls
Undesignated Active Work Areas	Equipment decon	D	• Hard Hat (workers on ground within reach of excavation equipment) • High - Visibility Safety Vests • Ear Plugs (as needed) • Leather work boots • Safety Glasses • Coveralls • Nitrile Gloves • Tyvek Coveralls/Raingear (workers in contact with soil)

Level C PPE Requirements

Location	Tasks	PPE Level	Equipment Required
Exclusion Zones	All Tasks	C	• Half mask air-purifying respirator equipped with HEPA cartridges • Hard Hat (workers on ground within reach of excavation equipment) • Leather Work Boots • Safety Glasses • Tyvek Coveralls/Raingear (workers in contact with soil) • Nitrile Gloves (workers in contact with soil) • Rubber Overboots • High-Visibility Safety Vests • Ear Plugs (As needed)
Contamination Reduction Zone	All Tasks	D	• Hard Hat (workers on ground within reach of excavation equipment) • Tyvek Coveralls/Raingear (workers in contact with soil) • Nitrile Gloves (workers in contact with soil) • Leather Work Boots • Safety Glasses • Rubber Overboots • High-Visibility Safety Vests • Ear Plugs (as needed)
Support Zone	All Tasks	D	• Hard Hat (workers on ground within reach of excavation equipment) • High-Visibility Safety Vests • Leather Work Books • Ear Plugs (as needed)

7.2 PPE LIMITATIONS

The PPE selected for use at the Project provides limited protection against chemical contaminants. Tyvek protective clothing must not be worn in areas where splashing of hazardous liquids on the skin is possible. In addition, persons performing hot work such as welding, brazing and metal cutting must not wear Tyvek clothing.

Half mask air-purifying respirators must not be worn in an oxygen deficient atmosphere or where concentrations exceed the capabilities of the respirator cartridge. In addition, respirator cartridges must conform to the airborne contaminants present at the Project. Always read the respirator cartridge prior to use to ensure that it is the correct type.

7.2.1 Heat Stress

Wearing PPE puts a worker at risk of developing heat stress. Heat stress can result in health effects ranging from transient heat fatigue to serious illness or death. Heat stress signs and symptoms are shown in Appendix B. Risk of heat stress will be reduced by the use of heavy equipment to reduce the requirement for manual labor. Risk of heat stress will be further reduced by regular monitoring of workers on the ground. Work schedules will be modified as needed according to monitoring results. Heat stress risk will also be reduced by providing potable water and encouraging the workers to drink a total of 1 to 1.6 gallons of water per day (a cup or two at each break).

7.2.2 PPE Work Mission Duration

Disposable protective clothing is to be disposed of after each use. Disposable protective clothing must be replaced upon re-entry into the EZ, or if the suit becomes damaged or saturated during use. Repairs to small rips may be made to protective clothing using duct tape.

7.2.3 PPE Maintenance and Storage

All PPE will be maintained in good condition. Any PPE found to be torn, cut, punctured or otherwise damaged will be disposed of immediately. After use and decontamination, respirators will be stored overnight in a closed container. The following day, the closed container will be transported to the PPE donning area for reuse.

7.2.4 PPE Training and Proper Fit Testing

All personnel will be thoroughly trained and limitations of the equipment they are assigned to wear. Annual qualitative respirator fit tests are required of all personnel wearing negative pressure respirators. Qualitative fit tests will utilize isoamyl acetate or irritant smoke. Fit tests must incorporate the make and size of respirator to be used. Additionally, a positive and negative fit test will be conducted each time the respirator is donned.

7.2.5 PPE Donning and Doffing Procedures

All PPE will be donned prior to entering the EZ. PPE will be donned with the assistance of a "buddy" to verify that equipment is worn properly. All PPE will be worn in accordance with the manufacturer's recommendations. At no time will a person remove the designated PPE while in the designated work zones. Disposable PPE will only be removed in the CRZ upon exiting the

EZ. Personnel will utilize seating (during decontamination and doffing procedures) to prevent tripping and falling.

7.2.6 PPE Inspection Procedures

Employees prior to donning will inspect PPE. Boots, gloves and disposable clothing found to be defective will not be worn and will be disposed of. Defective respirators, safety glasses and hard hats will be reported to the Site Health and Safety Officer.

7.2.7 Evaluation of the Effectiveness of the Program

Periodic inspections and observations of personnel using PPE will be made by the Site Health and Safety Officer to ensure that the PPE Program elements are being followed.

7.2.8 Respiratory Protection Program

This respiratory protection program provides the minimum requirements for respiratory protection whenever Level C or higher levels of personal protection are required.

7.2.9 Respirator Cartridges

The crewmembers working in an EPA Level C ensemble will wear half-mask air purifying respirators equipped with HEPA and organic vapor cartridges, depending on Project conditions.

7.2.10 Cartridge Changes

All cartridges will be changed a minimum of once daily. However, increased airborne concentrations and breathing rates may necessitate changes that are more frequent. Change will occur when personnel begin to experience increased breathing resistance, notice any unusual odor inside the cartridge or experience excessive heat generation in the cartridges. All cartridge changes will take place in the CRZ after decontamination of the exterior part of the PPE ensemble.

7.2.11 Respirator Inspection, Cleaning and Storage

The employee to whom they are assigned will maintain respirators. All respirators and associated equipment will be inspected and cleaned, as necessary, prior to use. Respirators will be decontaminated, cleaned and disinfected by the user during each decontamination episode. Harsh detergents and solvents must not be used to clean respirators. Cleaned respirators must be thoroughly dried before storing. Respirators will be checked periodically by the Site Health and Safety Officer. Respirators will be stored in a clean, dry container and out of direct sunlight. Respirators must also be stored in such a way that the face-piece is not deformed.

7.2.12 Respirator Us e with Facial Hair

No personnel will be permitted to wear a respirator with facial hair that interferes with the

respirator's sealing surface.

7.2.13 Respirator Use with Corrective Lenses

Full-face respirators use is not anticipated at the Project and use of corrective lenses will not be an issue.

7.2.14 Medical Cer tification for Respirator Use

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator.

7.2.15 Respirator Li mitations

The respirators specified for this Project have their limitations. Respiratory protection specified in may not be worn in atmospheres immediately dangerous to life or health (IDLH), in contaminant concentrations exceeding 10 times the PEL of that contaminant, or in oxygen deficient atmospheres. They may not be worn in concentrations that exceed ten times the Permissible Exposure Limit of any airborne contaminant.

8.0 ENVIRONMENTAL MONITORING

8.1 AIR MONITORING FOR DUST

8.1.1 Employee Air Monitoring for Dust

The Action Level for dust is 5 mg/m^3. Dust is visible at approximately 3 mg/m^3, therefore after the actual work operation commences and when materials are disturbed, visual air monitoring will be performed for each job task. The SSO will document the results of the initial visual monitoring, and the Project Superintendent will document the results of visual monitoring on a daily basis.

The SSO will be responsible for scheduled real-time air monitoring of representative activities during earthmoving as discussed below. In addition, if visual air monitoring indicates the presence of dust at a particular location or activity for periods in excess of 30 seconds, then real-time monitoring will be conducted as discussed below. If real-time monitoring indicates that dust is present at levels of potential concern, air monitoring for arsenic and lead will be performed using calibrated air-sampling pumps equipped with 37-mm MCE filter cassettes. If the employees are found to have exposures exceeding the established Action Level, then PPE will be upgraded until operations and techniques can be modified to bring airborne

concentrations below the Action Level. Employees will be notified of air monitoring results within 5 days of receipt.

8.1.1.1 Real-Time Air Monitoring for Dust

Personal air monitoring will be performed in the breathing zone of representative potentially affected workers at the commencement of earthmoving activities, as deemed necessary by the SSO. Data from sample locations will be collected to establish measurements of particulate concentrations in the work zones of the Project. Real-time air quality monitoring will indirectly measure the concentration of inorganic chemicals in respirable dust. Locations of the monitoring will be established by the Project Superintendent or SSO depending on planned excavation activities and prevailing wind conditions on the day of monitoring. Respirable dust air monitoring will be performed using a Monitoring Instruments for the Environment, Inc. (MIE) data logging real time monitor, model PDR-1000 respirable air monitor (RAM). The PDR 1000 is designed to measure the concentration of airborne particulate matter using a high sensitivity nephelometer (photometer) using a light scatter sensor. Sensitivity of the PDR 1000 is reported to range from 0.001 mg/m^3 to 400 mg/m^3. The RAM will be calibrated daily in the RAM calibration pouch.

The RAM will record continuous measurements of total respirable dust at one-minute intervals. The data logger records the one-minute and daily time-weighted-average of total respirable dust during each of the three workdays monitoring will be conducted on. Data will be collected over the approximate eight-hour work shifts in accordance with NIOSH 500 sample collection and analyses protocols for direct reading of total dust, not otherwise regulated.

Real-Time Particulate Monitoring

The strategies and methodologies for real-time particulate (dust) monitoring that will be used during soil excavation and load-out activities are designed to achieve the following goals:

- Measure concentrations of particulate dust generated during soil excavation and load-out activities in order to assign the appropriate personal protective equipment (PPE), additional soil stabilization and/or temporary work stoppage.
- Provide feedback to the SSO and site operations personnel regarding potential hazards from exposure to hazardous air contaminants generated through site activities.
- Measure particulate dust concentrations at points outside (upwind and downwind) of excavation and soil load-out exclusion zones. Air monitoring will be conducted during work activities to measure potential exposure of sensitive receptors to site chemical constituents, as a result of excavation and soil load-out activities.

Air monitoring will be performed during all site activities in which soil potentially containing elevated concentrations of arsenic, or elevated concentrations of particulate dust matter are being disturbed or handled. Real-time particulate monitors equipped with continuous data logging capability as well as instantaneous readings will be utilized during site activities. The monitors will be capable of measuring real-time concentrations and median particle size (PM1.0, PM2.5 and PM10) of airborne dust. In addition, air temperature and humidity will be measured. Three real time dust monitors will be used to monitor dust during excavation and soil load-out activities to protect the workers and the public. Two air monitors will be set-up in the downwind location to monitor potential offsite fugitive dust emissions and one monitor will be set-up in the upwind location. The monitors will be factory calibrated prior to the initial set-up and will be calibrated daily in the field according to the manufacturer guidelines.

The designated responsible SSO will be charged with responsibilities to include:

- Monitoring dust levels in the exclusion zone and other locations. The SSO will have the authority to stop work in the event that on-Site activities generate dust levels that exceed the Site or community action levels (see the chart below). The SSO will monitor meteorological data via weather reports and/or coordinate with off-site meteorological professionals to identify conditions that may require cessation of work (i.e., winds in excess of 25 mph). No specific PCAPCD wind velocity restrictions for soil excavation were found to exist. However, a self imposed action level for work stoppage will be set at a sustained wind velocity of 25 mph
- Site activities will comply with PCAPCD's Rule 202 Visible Emissions and Rule 207 Particulate Matter Concentration
- Assuring that all real-time particulate monitors are properly calibrated, in good working condition and placed in their respective upwind and downwind locations as weather conditions vary. Real-time, data-logging monitors will be used to measure dust levels. Pertinent real-time information will be conveyed to site workers
- Coordinate general site safety activities including all daily hazard communication, safety practices and procedure briefings
- Oversight of personal decontamination practices
- General site safety leadership, support and record keeping activities.

Air Monitoring Strategy and Methodologies

Dust level concentrations will be monitored in the following general locations:

Upwind (1)
Proximate to the exclusion zone
Two (2) fence line / downwind locations
As deemed necessary to determine employee exposure
(to be determined by SSO).

Air monitoring will be performed throughout soil excavation and load-out activities. The SSO and/or designated personnel will check the equipment every hour during operation. This frequency may be changed based on site conditions and newly available data.

Due to the fact that the site chemical of concern (COCs) in potential fugitive dust is exclusively particulate, there will be a focus on collection and analysis of airborne dust levels and concentrations of arsenic associated with dusts generated by construction and excavation activities. Site safety procedures, including dust control measures, will be based on the Action Levels specific in the chart below.

Chemical Name	PCAPCD Action Level	CAL/OSHA PEL[a]	ACGIH TLV[b]	Site Action Levels[c]	Community Action Level (Fence Line)[d]
Total Particulate Dust	Emissions of airborne dust beyond the property line	10 mg/m^3	10mg/m^3	5.0 mg/m^3	50 ug/m^3
Arsenic	NA	0.010 mg/m^3			

Notes:

[a] Permissible Exposure Limits (Cal/OSHA Article 107, Table AC1)

[b] 1990-1991 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists.

[c] Site Action Levels calculated as 10% of threshold limit value or PEL (as measured by NIOSH methods), whichever is lower.

[d] Community action level for total dust/particulate based on PCAPCD (applies to statewide regulations) regulations for fugitive dusts.

Community action levels for specific chemicals based on ATSDR MRL Equivalent Air Concentrations

A summary of results of real-time dust particulate monitoring will be available for review and published in the Report of Findings.

Real-time particulate dust monitoring data which includes the date, time, air monitoring readings, wind direction and temperature will be summarized in a table format as shown below.

AIR MONITORING DATA						
Date	**Time**	**Air Monitor ID/Location**	**Relative Humidity (%RH)**	**Wind Direction**	**Temperature (°F)**	**Air Monitoring Readings (PM_{10} $\mu g/m^3$)**

The site safety officer will record the above referenced information at intervals of approximately one hour during site activities.

8.1.2 Training Requirements of Monitoring Personnel

Personnel conducting air monitoring will have the training and experience necessary to properly perform the air monitoring and equipment calibration. The mechanical air monitoring of personnel will be performed under direct supervision of the Site Health and Safety Officer. Perimeter air monitoring will be performed under the direct supervision of the Environmental Consultant.

8.2 NOISE MONITORING

The permissible level of noise exposure without wearing hearing protection over an 8-hour period is an average of 80 decibels. Potential exposures to noise at this Site are intermittent, and therefore are not expected to exceed this limit. All equipment will be maintained to within the standard operating levels defined in the "Cat Handbook." Additionally, experience with work of this nature indicates that exposure to levels of noise requiring protection is very rare. However, workers will be instructed to use hearing protection if noise levels become uncomfortable. The Project will be screened for loud noise sources by the SSO or Site Superintendent and the screening will be documented. Engineering controls will be implemented to control loud noise sources. In addition, administrative controls in the form of Project noise control procedures include the requirement that the noise level from the contractor's operations shall not exceed 86 decibels at a distance of 15 meters from the Project, between the hours of 7 am and 7 pm, and shall not exceed 80 decibels at the property line between 7am and 7pm weekdays (65 decibels between 9am and 8pm on Saturday). If a noise source cannot be controlled adequately by engineering or administrative controls, then personal noise monitoring procedures will be implemented.

Previous surveys at typical WKA construction/remediation sites indicate that various pieces of heavy equipment and/or elements of treatment systems may produce continuous noise at or above the action level of 80 decibels over an 8-hour time frame. Such equipment on this project may include backhoes, dump trucks, or other heavy equipment. A noise dosimeter/sound level meter will be utilized during site activities to monitor noise levels. Heavy equipment activities such as backhoes or trucks will be ordered to shutdown upon noise levels exceeding 80 decibels. All WKA personnel within 25 feet of operating equipment, or near an operation that creates noise levels high enough to impair conversation, shall wear hearing protective devices (either muffs or plugs). All WKA personnel are in the WKA Hearing Conservation Program and have had baseline and, where appropriate, annual audiograms as part of the baseline or annual hazardous waste operations and emergency response (HAZWOPER) physical. Personnel will wash their hands with soap and water prior to inserting earplugs to avoid initiating ear infections.

8.3 DOCUMENTATION OF MONITORING

Records of monitoring results will be maintained at the Project. Records will include the date, time, contaminants or hazards monitored, person conducting monitoring, calibration date and method, operations and location of monitoring, and results. An air monitoring data sheet will be completed for each sample (Appendix D).

8.4 QUALITY ASSURANCE/QUALITY CONTROL

8.4.1 Field Quality Control Samples

Field blanks will be prepared for sample collection at a frequency of one duplicate for each ten samples of a given type. Laboratory method blanks shall be performed for all metals analysis at a rate of one in twenty (one for each batch up to a maximum of twenty).

8.4.2 Laboratory Internal Quality Control Checks

The laboratory shall analyze internal QC samples at the frequency specified by the method. The QC samples will include method blanks, laboratory duplicates and laboratory control samples. One method blank sample shall be analyzed for every 20 samples (minimum of one per day). Contamination in method blanks above the detection limit for organic and metals analysis is not allowed and will be rejected. One laboratory control sample will be analyzed for every twenty samples. All analytes in the calibration check samples must meet a standard of + or - 15% from the initial calibration. All samples must be bracketed by passing calibration check samples. Failure to bracket all samples with acceptable calibration checks will result in the reanalysis of the affected samples.

8.4.3 Project Organization and Quality Management Responsibilities

Mr. William Flores is a Senior Registered Professional Geologist for Wallace-Kuhl & Associates. He has overall responsibility for developing sampling plans for air monitoring, conducting the sampling, and requesting laboratory analysis. Mr. Flores has over 17 years of experience in the environmental field and implementation of Health and Safety Plans pursuant to 29 CFR 1910.120 and 8 CCR 5192.

8.4.4 List of Equipment, Containers and Supplies

If collection of dust samples is indicated by visual observations, the following equipment may be needed:

- air monitoring pumps,
- 37 mm MCE filter cassettes,
- calibration device,
- labels, and
- indelible marker.

8.4.5 Chain of Custody, Packing and Transportation

Samples shall be collected, transported and received under strict chain of custody protocols consistent with procedures established by the USEPA. Copies of chain of custody forms shall be completed whenever samples are sent to the laboratory. Upon receipt at the laboratory, the laboratory will implement their internal chain of custody program during each phase of the analytical process. The chain of custody forms shall be used to document the condition of the samples on arrival at the lab.

9.0 INFORMATIONAL PROGRAMS

The company's Injury and Illness Prevention and Hazard Communication Programs will be available on site. Employees, contractors, and subcontractors will also be informed and will share information on chemical hazards at the Project, as required by the Hazard Communication standard. MSDS for all hazardous materials used on site will be made readily available to site personnel. Employees, contractors, and subcontractors working outside of the operations part of a site will only be notified of chemical hazards as required by the Hazard Communication standard.

10.0 DECONTAMINATION PROCEDURES

Due to the relatively low health risk from metals, no perimeter or work zones are required during work operations at the site. Should any suspected or known material contamination be found during the course of work, a secure perimeter will be established around the impacted area until modifications can be made to the Health and Safety Plan.

10.1 PERSONNEL DECONTAMINATION

For personnel conducting activities within work zones containing identified hazardous materials, hand and eye wash facilities will be provided. Prior to eating, drinking, and/or smoking, on-site workers are required to wash their hands thoroughly. In addition, food and beverage should be kept out of the work zone. All personnel will be required to wash their hand and faces prior to leaving the Site at the end of the workday or prior to taking breaks, such as lunch. It is recommended that a shower be taken at the end of the workday upon reaching one's residence prior to the next meal. All disposable protective equipment shall be left on the site and bagged for the appropriate disposal. Boots will be brushed to remove material from the Site. The following minimum equipment will be present in the work zones:

- Brushes with handles for boot cleaning
- Water with hand/face wash/rinse basins
- Hand soap and paper towels, and
- Plastic garbage bags for used protective clothing.

If site monitoring identifies the need to implement an exclusion zone and use of PPE, then proper decontamination procedures will be implemented prior to exiting the contaminant reduction zone. Otherwise, proper decontamination procedures will be implemented prior to exiting the site.

10.2 EQUIPMENT DECONTAMINATION PROCEDURES

To minimize the spread of contaminated materials, equipment will be cleaned prior to movement out of active work zones. The dump trucks will be dry brushed for removal of material from the truck body and tires prior to exiting work zones. Prior to exiting the work zone, e.g., crossing public thoroughfares or completion of contaminated material excavation, the excavator and loader will be cleaned. Cleaning of the excavator will include extending the bucket over a dump truck and brushing or water washing.

Material on the excavator or loader tracks and/or tires will be removed by dry brushing. During dry conditions, material residues will be removed from equipment by dry brushing.

11.0 EMERGENCY RESPONSE PLAN

This emergency response plan explains how to handle anticipated emergencies prior to the commencement of hazardous waste operations.

11.1 EMERGENCY PROCEDURES

Employees may respond to low danger emergencies, such as administration of first aid, fighting small fires (with fire extinguishers), and clean-ups of small chemical spills (of less than 55 gallons or 500 pounds). All employees will evacuate from the danger area when an emergency not listed above occurs, and will not assist in handling the emergency. Should outside medical or other emergency assistance be required, personnel will notify the job trailer of the nature of the emergency and a call will be to 9-1-1. If the injury or illness appears to be minor, the affected person appears to be minor; the person may be driven to the emergency room of the nearest hospital.

11.2 DENTIFICATION OF NEAREST MEDICAL ASSISTANCE

Name: Sutter Roseville Medical Center
Address: 1 Medical Plaza (near Sunrise Ave. at E. Roseville Parkway.), Roseville, CA
Telephone: 916-781-1000

In an emergency, call 911. The Hospital Location Map is shown on Figure D-1.

11.3 SITE COMMUNICATIONS AND ALERTING MEANS FOR EMERGENCIES

Temporary radio and telephone communications will be established at the site. Emergency alerts will be made using two-way radios from the job trailer to the site, or vice versa. Personnel working on the site will be alerted by air horns using the following alerts:

3 short blasts in sequence.....Exit the work area
1 long blast.....All clear

11.4 PLACES OF REFUGE

All personnel, when alerted during emergencies, will exit the area of concern. Personnel are to remain in the staging area and await further instructions.

11.5 STATUS AND CAPABILITIES OF EMERGENCY RESPONSE PROVIDERS

Local emergency responders (fire department, medical providers and transporters) are on full time alert and have the capabilities to respond to any anticipated site emergency.

- Fire Department – 911
- Office of Emergency Services– (530) 749-7520

11.6 PRE-EMERGENCY PLANNING

The types of emergencies anticipated include personal injuries, fire, and small chemical spills. An OSHA-approved first aid kit will be made available at the site.

In addition, two employees trained and currently certified in first aid and CPR will be on site at all times. A charged and inspected fire extinguisher will be available on each piece of equipment. Spill containment equipment will be made available if hazardous materials are stored on site.

11.7 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATION

The Project Superintendent will act as the incident commander during an emergency response. He will coordinate and direct emergency response procedures to all site personnel. An emergency will be communicated to all persons on site by radio and/or verbal communications.

11.8 EMERGENCY RECOGNITION AND PREVENTION

All site personnel will be trained to recognize when an emergency has arisen and will know how to notify the Project Superintendent of the incident. Site personnel will use safe work practices to minimize the potential for an incident. Regular safety meetings will be held to identify and communicate problem areas at the site.

11.9 SITE SECURITY AND CONTROL

During an emergency, the contractor's personnel are responsible for assuring the public's safety; the contractor's personnel will keep all bystanders and unauthorized personnel from entering the site. At no time will personnel give statements regarding an emergency to persons not associated with emergency response or management.

11.10 DECONTAMINATION OF INJURED WORKERS

Due to the relatively low health risk from lead, decontamination procedures for injured workers may be limited to removal of outer coveralls and boots so long as such action will not aggravate the injury. If the injury is minor, and does not require immediate medical attention, workers may decontaminate as usual.

11.11 ACCIDENT REPORTING AND FOLLOW-UP

All incident scenes will be preserved so that a thorough incident investigation may be performed. All causes of the incident will be investigated and the findings presented to site personnel to prevent future incidents.

11.12 SPILL CONTAINMENT

It is not anticipated that large volumes of hazardous materials will be stored on site. However, if large volumes of hazardous or potentially hazardous liquids are stored on site, adequate secondary containment will be provided around the storage area. In addition, spill containment equipment (absorbent socks, clay, and shovels, and a salvage drum) will be kept at the site to respond to small spills of hazardous liquids or solids. If a spill occurs, immediate steps to contain the spill must be taken. Such steps include shutting of valves, closing doors or vents, protecting sanitary sewers and surface waters, or shutting off pumps. At no time will a spill be contained if such action presents a hazard. The Site Health and Safety Officer must then be notified of the situation so that he may direct the cleanup.

11.13 CONFINED SPACE ENTRY

It is not anticipated that the work activities will include confined space entry. Therefore, this section has been omitted. For any other confined space entry operations that may be performed as a part of the construction activities, please refer to the IIPP.

11.14 SITE EXCAVATIONS

Site excavations created during initial site preparation or during material excavation will be shored or sloped as appropriate to prevent accidental collapse in accordance with 8 CCR, Chapter 4, Subchapter 4, Article 6.

11.15 SAFETY INSPECTIONS

Inspections will be conducted by the Project Superintendent or, in the absence of that individual, another individual who is knowledgeable in occupational health and safety, acting on behalf of the employer as necessary to determine the effectiveness of the Health and Safety Plan. The employer will correct any deficiencies in the effectiveness of the Health and Safety Plan.

12.0 SIGNATURES

Signatures below indicate that employees and subcontractors working on-site in the exclusion zone have reviewed the Health Safety and Work Plan and/or participated in a tailgate session discussing the key aspects of the Plan.

PRINT NAME	SIGNATURE

13.0 REFERENCES

Agency for Toxic Substances and Disease Registry, *Toxicological Profile Information Sheets*, http://www.atsdr.cdc.gov/toxprofiles/#Final, 2003.

American Conference of Governmental Industrial Hygienists, *Threshold Limit Values for Chemical and Physical Agents and Biological Exposure Indices, 2000-2001*.

CDC, 2003. *Second National Report on Human Exposure to Environmental Chemicals,* Centers for Disease Control, January 2003.

Sax, Irving A., Dangerous Properties of Industrial Materials, 1984.

United States Department of Health and Human Services, *NIOSH Pocket Guide to Chemical Hazards*, 2001.